06 November 2012

Issued for Construction

SUBLET SITE CONSTRUCTION SPECIFICATIONS

FOR

FEMA EMERGENCY RADIO NETWORK
STATION WSRV - FM
GAINESVILLE, GEORGIA

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SECTION 01 11 00.00 50

SCOPE OF SUBLET WORK

(11/06/12)

PART 1 GENERAL

1.1 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00.00 50 SUBMITTALS & QUALITY CONTROL:

SD-01 Preconstruction Submittals

Submit the following items to the KBR Lead Document Control Specialist a minimum of two weeks prior to mobilizing on site unless indicated otherwise.

Certificate of Insurance (within two weeks after subcontract award)
Statement of Acknowledgement Form SF 1413 (within two weeks after subcontract award)
Name and contact information of on-site Supervisor
List of trades and personnel for weekend work (when requested)
List of Contact Personnel
Site Utilization Plan
Project Schedule
2-Week Look-Ahead Plan
Activity Hazard Analysis
Crane certifications and lifting plans
Permits
Underground Utilities Coordination Drawing
Purchase Orders / Delivery Confirmation

1.2 WORK COVERED BY SUBCONTRACT DOCUMENTS

1.2.1 Project Description

The work includes site construction associated with the FEMA Primary Entry Point (PEP) Expansion Program and incidental related work. Subcontractor shall furnish and install all components necessary for complete assemblies according to the contract documents. The scope includes the in-place closure of a 1000-gallon single-wall steel underground storage tank with a poly-tank jacket. The scope also includes, but is not limited to, all earthwork, erosion and sediment control, clearing and grubbing, excavating, hauling, loading, unloading, dewatering, trenching, backfilling, soil treatment for termite control, cast in-place concrete footings and foundations, forms, reinforcing bars, expansion joints, pre-molded expansion joint filler, finishing, gravel surface material, vaults, concrete curbing, chain link fence, chain link gates, posts, rails, braces, wire, ties, miscellaneous fittings and hardware, ice break structures, sign, closure of existing underground storage tank, installation of above ground fuel storage tank, fuel oil system piping and controls, painting and labeling of all fuel piping, setting fuel oil system components, day tank, and electrical work including temporary power, grounding,

electrical service, emergency power generator, fuel system management control, fuel filtration system process control, lighting, and communications as necessary to provide a complete installation and fully operational system in full accordance with plans and specifications. Work shall be in accordance with all applicable codes, ordinances, and industry standards.

Subcontractor shall furnish all necessary labor, material, equipment, supervision, permitting, taxes, and all incidentals to provide complete and operational system in accordance with the Subcontract Documents except for work or furnishing of materials specifically designated as by KBR or by others.

1.2.2 Location

The Sublet Work will be performed and completed at the following location:

5510 Union Church Road, Flowery Branch, GA 30548, Hall County.

1.2.3 Period of Performance

Upon mobilization on site, subcontractor shall have a **seventy-seven (77) calendar day** period from site mobilization to final inspection to complete all sublet work ready for final inspection and acceptance per the project schedule. All testing, pre-final inspections, and punch list, if any, shall be complete prior to final acceptance.

1.3 SUBCONTRACT DRAWINGS, SPECIFICATIONS AND REPORTS

The drawings and specifications are complementary to each other. What is called for by one shall be as binding as if called for by both. In the event of discrepancies between the drawings and specifications, the drawings shall generally take precedence. Any conflict between the drawings and the specifications shall be referred to KBR as soon as possible for resolution.

Subcontractor shall maintain a complete and current copy of all drawings, specifications, and reports at the project site throughout project execution.

1.3.1 Drawings

The following drawings accompany the subcontract and are a part thereof.

Drawing No.	Title	Rev	Dated
G-001	VICINITY MAP AND INDEX	0	10/15/12
G-101	SITE PLAN	0	10/11/12
C-101	STORMWATER MANAGEMENT PLAN	0	10/11/12
C-102	CIVIL PLAN	0	10/11/12
S-001	STRUCTURAL GENERAL NOTES	0	10/11/12
S-101	FOUNDATION & FENCE PLAN	0	10/11/12
S-102	GENERATOR AREA PLANS	0	08/24/12
S-103	ICE BREAKER STRUCTURE PLAN	0	10/11/12

Drawing No.	Title	Rev	Dated
S-104	TRANSMITTER MODULE FOUNDATION PLAN	0	08/24/12
S-201	ICE BREAKER STRUCTURE ELEVATIONS, SECTS & DETAILS	0	10/11/12
S-202	ICE BREAKER STRUCTURE ELEVATIONS	0	10/11/12
S-203	ICE BREAKER STRUCTURE ELEVATIONS & SECTIONS	0	08/24/12
S-301	MISCELLANEOUS SECTIONS	0	10/11/12
S-501	MISCELLANEOUS DETAILS	0	10/11/12
S-502	SIGN DETAILS	0	08/24/12
S-701	MODULE ICE BREAKER STRUCTURES	0	08/24/12
M-101	MECHANICAL FUEL SYSTEM PLAN	0	10/11/12
M-201	MECHANICAL FUEL SYSTEM ELEVATIONS	0	10/11/12
M-202	MECHANICAL FUEL SYSTEM ELEVATIONS	0	10/11/12
M-501	FUEL PIPING DETAILS	0	10/11/12
M-601	FUEL SYSTEM P&ID	0	10/11/12
M-602	FUEL SYSTEM P&ID LEGEND AND SCHEDULES	0	10/11/12
E-101	ELECTRICAL SITE PLAN	0	10/15/12
E-102	ELECTRICAL MODULE GROUNDING PLAN	0	10/15/12
E-103	TRANSMITTER MODULE GROUNDING PLAN	0	10/15/12
E-104	ELECTRICAL MODULE POWER PLAN	0	10/15/12
E-105	ELECTRICAL MODULE POWER PLAN	0	10/15/12
E-106	ELECTRICAL STATION FLOOR PLAN	0	10/15/12
E-401	TRANSMITTER/GENERATOR ELECTRICAL PANEL SCHEDULES	0	10/15/12
E-402	TRANSMITTER/GENERATOR ELECTRICAL RISER DIAGRAM	0	10/15/12
E-403	TRANSMITTER/GENERATOR ELECTRICAL PANEL SCHEDULES	0	10/15/12
E-404	TRANSMITTER/GENERATOR UPS/TIME DELAY DIAGRAM	0	10/15/12
E-501	INSTALLATION DETAILS	0	10/15/12
E-502	INSTALLATION DETAILS	0	10/15/12
E-503	INSTALLATION DETAILS	0	10/15/12
E-504	INSTALLATION DETAILS	0	10/15/12

Within the drawings, the terms "Contractor", "Site Contractor" and "Site Installation Contractor" shall mean Subcontractor and the term "Owner" shall refer to KBR or Others.

1.3.2 Specifications

The following specifications accompany the subcontract and are a part thereof.

Spec. Section	Title	Dated
01 11 00.00 50	SCOPE OF SUBLET WORK	11/06/12
01 33 00.00 50	SUBMITTALS & QUALITY CONTROL	05/24/11
03 30 53	MISCELLANEOUS CAST-IN-PLACE CONCRETE	08/08/12
05 12 00	STRUCTURAL STEEL	08/08/12
23 10 20	FACILITY FUEL OIL SYSTEM	10/11/12
23 10 30	DAY TANK PACKAGED UNIT	10/11/12
26 05 00.00 40	COMMON WORK RESULTS FOR ELECTRICAL	10/15/12
31 23 00.00 20	EXCAVATION AND FILL	08/08/12
31 31 16	SOIL TREATMENT FOR SUBTERRANEAN TERMITE CONTROL	09/24/10
32 31 13.53	HIGH SECURITY CHAIN LINK FENCES AND GATES	08/08/12

Within the specifications, excluding Division 1, the terms "Contractor", "Site Contractor" and "Site Installation Contractor" shall mean Subcontractor and the term "Owner" shall refer to KBR or its other suppliers.

1.3.3 Reports

The following reports accompany the subcontract and are a part thereof.

Title	Dated
Geotechnical Report by Geoscience Group	7/2/12
Geophysical Report by Geophysical Survey Investigations	12/3/10
WSRV Topographic Survey by Boundary Zone	11/24/10

The Geotechnical Survey Report provides results of the subsurface soil exploration analysis and recommendations for the site.

1.4 WORK HOURS

1.4.1 Standard work hours will be from 7:00 a.m. to 4:00 p.m., Monday through Friday, or as otherwise arranged by mutual agreement with KBR and local facilities personnel. All Subcontractors will schedule their respective work according to these hours. Unscheduled work outside the established regular hours will not be allowed unless otherwise approved by KBR.

1.4.2 Work before 7:00 a.m. or beyond 4:00 p.m. must be scheduled and approved by KBR a minimum of 24 hours prior to work being performed except for weekend work which must be scheduled by the end of the workday on Thursday. When requesting work be performed on a weekend, subcontract shall submit a written list of all trades and personnel for which the request is being made.

1.4.3 A maximum of 12 hours may be worked in any one workday.

1.4.4 Unless otherwise approved by KBR, no work will be performed on the following holidays:

New Year’s Day
Memorial Day
Independence Day
Thanksgiving Day and Day after Thanksgiving
Christmas Day

1.5 SITE SUPERVISION

1.5.1 Subcontractor shall designate in writing a full time Supervisor employed by the subcontractor. The Supervisor shall be on-site at all times during performance of the work to lead employees and subcontractor's lower tier subcontractors to successful project execution through completion of the work. The Supervisor must have the ability to effectively communicate, make sound decisions, and have the authority to carry out those decisions. The Supervisor must have past experience as a Supervisor on projects similar in size and complexity. No work will be allowed without the designated Supervisor on-site.

1.5.2 Subcontractor shall provide full-time onsite supervision during all phases of the work. The supervisor shall have full authority to act on behalf of the subcontractor and shall be responsible for coordinating the layout and work performed by lower-tier subcontractors. Unless subcontractor assigns another competent employee, the onsite supervisor shall monitor and ensure compliance with all EM385-1-1, OSHA and KBR safety requirements and shall have authority to act on behalf of the subcontractor to remove from the site any person(s) not complying.

1.5.3 Once designated, subcontractor's Supervisor shall not be changed during execution of the project without the KBR's approval.

1.6 KBR / OWNER FURNISHED MATERIALS

1.6.1 KBR shall furnish prefabricated concrete enclosed transmitter and 35 kW diesel engine generator set modules as indicated on the drawings. Subcontractor is responsible for providing power and communication services to the modules as indicated on the drawings.

1.6.2 KBR shall furnish one 8,000 gallon double wall UL-142 shop fabricated aboveground diesel fuel storage tank (AST), ladder/platform system, remote fill box, fuel filtering system, control panels and instrumentation for installation by subcontractor. However, KBR is responsible for final control terminations, start-up and testing of the fuel control and monitoring system.

1.7 MATERIAL DELIVERIES

1.7.1 Subcontractor provided materials

Delivery of subcontractor provided materials to the jobsite shall be coordinated with KBR a minimum of 24 hours in advance. Subcontractor is responsible for providing all labor and equipment necessary for safely off loading and receiving deliveries. Materials stored on-site shall be protected from the elements. Provide legible copies of all material delivery tickets for inclusion in KBR Quality Control reports.

1.7.2 Prefabricated concrete enclosed transmitter and generator modules

Delivery of prefabricated concrete enclosed transmitter and generator modules shall be by others. KBR will confirm delivery schedule with Subcontractor one week in advance. Others are responsible for providing all labor and equipment necessary for safely off loading and receiving the delivery and anchoring the modules to the slabs. Subcontractor is responsible to remain clear of crane working area.

1.7.3 Shop fabricated above ground storage tank and fuel system

Delivery of 8,000 gallon fuel tank, fill box, fuel filtering system and fuel monitoring system to the site shall be by others. KBR will confirm delivery schedule with Subcontractor one week in advance. Subcontractor is responsible for providing all labor and equipment necessary for safely off loading and receiving the delivery, assembling and anchoring of the fuel tank to the slab.

KBR shall furnish subcontractor equipment shop drawings for lift planning. Installation and assembly instructions will be furnished by KBR as soon as possible but no later than the date of the delivery.

1.7.5 150 gallon UL-142 double wall day tank

Delivery of the day tank and accessories to the site shall be the responsibility of the Subcontractor. KBR will confirm delivery schedule with Subcontractor one week in advance. Subcontractor is responsible for providing all labor and equipment necessary for safely off loading and receiving the delivery, setting the tank and installing in accordance with manufacturer's installation instruction and the project drawings and specifications.

1.7.6 Diesel Fuel

Prior to scheduling delivery of diesel fuel, Subcontractor shall coordinate with KBR and ensure all Federal, State and local requirements have been complied with. The Subcontractor is responsible for filling the main diesel storage tank to 90% of fuel tank capacity in conjunction with testing. Subcontractor shall fill tank using installed fill-port system so that overfill prevention safeguards will be operational. If required, “topping off” of the tank to 90% of the tank’s capacity after testing will be reimbursed by KBR to the Subcontractor at actual cost. The initial filling of fuel tank shall be in accordance with Federal, State and local requirements. Fuel oil shall be in accordance with Appendix A of specification 23 10 20 and as coordinated with generator manufacturer. Contractor shall use appropriate amount of approved biocide during initial fill.

1.7.7 Fuel Delivery

Subcontractor shall coordinate with fuel delivery company to ensure fuel truck is equipped with grounding conductor of sufficient length to connect to grounding grid and hose fitting needed to connect to the 3” fill port coupling.

1.8 SPECIAL SCHEDULING REQUIREMENTS

1.8.1 The existing transmitter facility will remain in operation during the entire construction period. Subcontractor shall conduct his operations so as to cause the least possible interference with normal operations of the radio station and adjacent properties. Power shall not be interrupted during normal business hours. All shutdowns / outages deemed necessary by the Subcontractor shall be performed during outside normal operating hours and shall be coordinated with KBR and approved by local facilities management personnel in advance.

1.8.2 Subcontractor shall coordinate closely with KBR with regard to scheduling the delivery of the pre-cast concrete modules and fuel tanks to the site. Subcontractor and KBR will jointly deem the site is ready to set the equipment in its final location. Double handling of equipment and on-site storage of fuel tanks should be avoided in all cases.

1.8.3 Subcontractor is advised that existing grounding system must be re-routed and completed prior to the excavations of the foundations. Subcontractor shall hand excavate to expose the grounding system. Once exposed, a jumper shall be installed for all ground wires that are in the area of excavation prior to cutting. Any damage to the grounding system must be corrected IMMEDIATELY.

1.8.4 Subcontractor shall coordinate all phases of construction with lower tier subcontractors to ensure smooth, continuous operations, productivity and timely inspections from the Inspection Agencies. After the subcontractor has mobilized onsite, the work shall proceed diligently until completed. Should onsite activities be interrupted for any reason, the subcontractor shall immediately notify KBR.

1.8.5 Subcontractor shall schedule all applicable inspections and tests of his work as required by the Agencies Having Jurisdiction or industry standards. Subcontractor shall notify the KBR a minimum of 24 hours prior to inspections and / or tests.

1.8.6 No cutting or drilling of holes in structural members will be permitted unless written permission has been obtained from the Engineer. Subcontractor shall exercise diligence in laying out the work in advance to avoid interruptions to the work.

1.8.7 All final connections to the antenna tower for testing purposes will be made by others.

1.9 CONTRACTOR ACCESS AND USE OF PREMISES

1.9.1 Subcontractors and Personnel Contacts

Furnish a list of contact personnel for the project to include lower tier subcontractors. Provide name, position, addresses and telephone numbers for use in the event of an emergency. As changes occur and additional information becomes available, correct and change the information contained in previous lists.

KBR reserves the right to direct the Subcontractor to permanently remove any construction employees from the project site with cause.

1.9.2 Site and Building Access

Contractor shall be working in and around existing occupied facilities. Do not access the site or enter any building within the project limits without prior approval of KBR.

1.9.3 Site Utilization Plan

Prior to mobilizing on site, KBR is responsible for obtaining site utilization approval from the station owner's representative. KBR and subcontractor shall jointly develop the plan based on existing site conditions and subcontractor's site needs prior to the pre-construction conference. The objectives of the plan are to minimize site disturbance while maximizing safe and efficient construction.

1.9.4 Site Construction Entrance

Subcontractor is responsible to maintain all existing roadways and entrances to the construction site free of dirt and debris resulting from construction traffic. Subcontractor shall provide positive drainage during construction and throughout the required duration to maintain the temporary roadways free from washouts and other water damage.

1.10 PRECONSTRUCTION CONFERENCE

After award of the subcontract but prior to commencement of any work at the site, subcontractor and key subcontractors who will engage in the work, shall attend a preconstruction conference conducted by a representative of the US Army Corps of Engineers. The purpose of the meeting is to discuss and develop a mutual understanding relative to the contract administration, safety program, submittals, scheduling, and prosecution of the work.

1.11 PROJECT SCHEDULE

1.11.1 General Requirement

Subcontractor shall provide a critical path project schedule (Microsoft Project or approved equal) reflecting, as a minimum, each definable feature of work. The schedule shall be submitted to KBR for approval prior to the preconstruction conference. The schedule shall show the sequence in which the subcontractor proposes to perform the work and dates on which the subcontractor contemplates starting and completing all schedule activities. The schedule should be suitable for forward planning as well as a tool for project monitoring and include activities associated with procurement of materials and equipment with a lead time over three weeks. Subcontractor shall post the approved project schedule at the job site. The schedule shall be updated bi-weekly or as necessary to reflect project completion on or before the current contract completion date.

1.11.2 Schedule Activities by Others

In addition to activities described under General Requirements, the following activities shall be included to assist in the coordination between subcontractor's scope of work and work performed by others. It is preferred that delivery of transmitter and GenSet modules and fuel system occur during the first half of the construction performance period in order to provide sufficient remaining duration for successor activities.

Deliver / Set Transmitter & GenSet Modules: 3 day duration starting one week after placement of concrete.

Deliver Fuel Tank System: 1 day duration starting a minimum of one week after placement of concrete. If delivery of fuel system is desired to be on the same day as modules delivery, subcontractor shall coordinate and obtain KBR approval in advance. Note, installation of ice break structure over fuel tank should not start until after the new fuel storage tank is set.

Fuel System Tie-in & Testing: 2 day duration starting after completion of fuel system electrical scope by subcontractor and completion of fuel piping installation and testing. Subcontractor must complete electrical hookup to and between the modules prior to testing of the fuel system and all work should be substantially complete at completion of fuel system testing.

Start-Up and Testing of 35-kW GenSet: 2 day duration scheduled to start on day two of the fuel system tie-in and testing activity.

HEMP Testing: 3 day duration starting at completion of 35kW GenSet start-up and testing by others.

System Integration Testing: 2 day duration starting at completion of HEMP Testing.

1.12 2-WEEK LOOK AHEAD SCHEDULE

Subcontractor shall prepare and submit a 2-Week Look Ahead schedule to provide a more detailed day-to-day plan of upcoming work identified on the Construction Schedule. The work plans shall be updated each week to show the planned work for the current and following one-week period. Additionally, include upcoming outages, closures, preparatory meetings, and initial meetings. The detail work plans are to be maintained separately from the Construction Schedule and on an electronic spreadsheet program and printed on 8 ½ by 11 sheets. Activities should be listed vertically in rows with calendar days listed horizontally in columns. Use an "X" to signify the day(s) on which the activity is scheduled to occur. Activities should not exceed 5 working days in duration and have sufficient level of detail to assign crews, tools and equipment required to complete the work. Submit electronically to KBR no later than 2 p.m. each Friday.

1.13 TEMPORARY FACILITIES, UTILITIES AND WORK

Subcontractor shall provide all temporary facilities for its use, including but not limited to portable toilets, debris dumpsters, water, power, telephone or any other utility connections that may be required to support Subcontractor’s construction operations at the site. Subcontractor’s use of Owner facilities will not be permitted for offices, electrical power, telephone, water, toilets, dumpsters, break rooms, cafeteria or lunch rooms. All costs for temporary facilities and utilities are the responsibility of the subcontractor.

The Subcontractor is responsible for providing temporary protection of his work. The temporary protection must be durable, weatherproof and secured properly. Construction materials and equipment must be stored and protected in accordance with manufacturer’s recommendations. Temporary fencing for Subcontractor lay down, parking, and construction area shall be installed in accordance with the Site Utilization Plan.

1.13.1 Trailer-Type Mobile Office

Subcontractor shall furnish and maintain a trailer-type mobile office providing as a minimum the facilities specified herein. Indicate

location of trailers and storage buildings on the Site Utilization Plan.

Trailers or storage buildings will be permitted, where space is available, subject to the approval of KBR. The trailers or buildings shall be in good condition, free from visible damage rust and deterioration, and meet all applicable safety requirements. Trailers shall be roadworthy and comply with all appropriate state and local vehicle requirements. Failure to maintain storage trailers or buildings to these standards shall result in the removal of non-complying units at the Subcontractor's expense. A sign not smaller than 24 by 24 inches shall be conspicuously placed on the trailer depicting the company name, business phone number, and emergency phone number. Trailers shall be anchored to resist high winds and must meet applicable state of local standards for anchoring mobile trailers.

Provide on the jobsite an office with approximately 80 square feet of useful floor area for the exclusive use of the KBR Site Manager. Provide a weather tight structure with adequate heating and cooling, lighting, a work surface, two chairs and two (2) 120 Volt / 15 Amp convenience outlet. Provide a door with a cylinder lock and windows with locking hardware. Temporary power from a portable generator located no closer than 100 feet to the structure is acceptable. After completion of the work, remove the entire structure from the site.

1.13.2 Temporary Sanitation Facilities

Subcontractor shall comply with OSHA and EM-385-1-1 minimum requirements for sanitation including housekeeping, waste disposal, provisioning of drinking water, and provisioning of construction site toilet and washing facilities.

1.13.3 Construction Dumpsters

The work site shall be kept clean on a daily basis. All construction debris shall be removed from Owner’s property and disposed of or recycled in a legal manner. All loose material shall be secured/properly stored at the end of each workday and the work site shall be left clean. Upon completion of all work, final clean up shall be accomplished to ensure the area is left in a clean and orderly condition, satisfactory to KBR. Coordinate Subcontractor supplied dumpster placement with KBR during site utilization planning. USE OF OWNER DUMPSTERS IS PROHIBITED.

1.13.4 Temporary roadways and entrances

Subcontractor shall construct and maintain all required temporary construction entrances as required by existing site conditions. Temporary construction entrances shall be incorporated into the Site Utilization Plan and shall be maintained by the Subcontractor. Subcontractor shall provide any and all temporary fencing resulting from construction of temporary entrances that may be required to maintain the existing security level. Temporary fencing must allow for delivery of the pre-cast modules by others. Prior to pre-final inspection, temporary entrances and roadways shall be removed and site restored.

1.13.5 Temporary Utilities

Subcontractor shall provide temporary power, water, and communication services as required to perform the work. No unmetered electrical power from the project site may be used. Subcontractor is responsible for associated costs including costs of connection and disconnection.

1.13.6 Temporary Protection

Subcontractor is responsible to provide and remove all temporary protection of his work. All protection will remain in place until Substantial Completion unless directed otherwise by the KBR.

1.13.7 Temporary power for station operation

Subcontractor shall furnish appropriate temporary power generator and suitable temporary electrical distribution system equipment as required to maintain critical facilities operation during outages required by performance of the work.

1.14 SAFETY REQUIREMENTS

1.14.1 General

Subcontractor is responsible for complying with KBR's project specific Accident Prevention Plan. The plan incorporates requirements of the US Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, dated 15 Sep 08 and KBR's Health, Safety and Environment policy, both of which reflect requirements of OSHA and best practices for an incident free work site. A copy of the plan will be maintained on-site by KBR. Subcontractor's Supervisor or other person as designated is responsible for ensuring compliance with the plan by its employees and lower tier subcontractors at all times while within the project limits. Subcontractor is responsible for 'Competent Persons' as required by OSHA.

The EM 385-1-1 Safety and Health Requirements Manual with Errata and Changes are available on-line at http://www.usace.army.mil/CESO/Pages/EM385-1-1.aspx. Up to 2 hard copies of the Manual may be ordered by sending an email request to Hector Hunt, (Hector.N.Hunt@usace.army.mil), including your name, postal address, and publication name/number.

1.14.2 Radio Station Hazards

Subcontractor shall to ensure all employees and delivery drivers are aware they will be working in close proximity to High Voltage lines on the project sites. All cranes and equipment shall be grounded and subcontractor should be familiar with and comply with OSHA and FCC RF Standards.

1.14.3 Safety Meetings

Subcontractor's representatives who have a responsibility or a significant role in accident prevention on the project shall attend the preconstruction conference. Prior to the meeting, subcontractor shall

submit to KBR a listing of anticipated activities for which Activity Hazard Analyses (AHAs) will be developed and implemented during the performance of the work.

All Subcontractor and lower tier subcontractor personnel assigned to the project are required to attend a project specific safety orientation meeting conducted by KBR before starting work on site.

Subcontractor and lower tier subcontractors shall attend a daily safety meeting (Tool Box Meeting) at the beginning of each work day. Attendees shall sign attendance roster listing topic discussed.

Subcontractor and lower tier subcontractors shall attend a weekly safety meeting conducted each Friday. Attendees shall sign attendance roster listing topics discussed.

Subcontractor’s Supervisor and lower tier subcontractors' supervisors shall attend a monthly supervisory safety meeting. Attendees shall sign attendance roster listing topics discussed

1.14.4 Medical and First-Aid Requirements

Subcontractor’s attention is called to EM 385-1-1 Section 3 for medical and first aid requirements applicable to all work performed on site. Because the project site is not located within five minutes of a medical facility, at least two employees shall be qualified to administer first-aid and CPR.

1.14.5 Personnel Protective Equipment

Subcontractor shall furnish, maintain, and require use of the necessary Personal Protection Equipment (PPE) at all times throughout the duration of the Sublet Work as required by KBR, the USACE and by the governing regulatory agencies. Subcontractor shall maintain spare hard hats, safety glasses, safety vests, hearing protection, hand cleaner and box of rags on site at all time.

Personnel protective equipment shall be used and the following dress code is required at all times while workers are on the project site:

a. Hard Hats (Interior and Exterior)
b. Safety Glasses
c. Shirts with minimum 4” sleeves
d. Long pants
e. Safety Vest
f. Hearing protection
g. Hard sole shoes

1.14.6 Vehicle / Equipment / Traffic Safety

Subcontractor shall be aware of the existing traffic conditions around and within the project site. It is the Subcontractor's responsibility to ensure that the flow of vehicular or pedestrian traffic is not hampered or exposed to any danger. Coordinate deliveries into the jobsite with extreme caution. Use qualified flagmen and “spotters” when necessary. Subcontractor’s input to the Site Utilization Plan shall

provide for safe movement of personnel, construction equipment, delivery vehicles, and contractor parking as appropriate for the site.

1.14.7 Fire Prevention and Protection

Temporary equipment, fuel, petroleum products or hazardous materials storage must conform to all Federal, State, Local and Permit requirements. USACE and OSHA requirements must be adhered to.

All torches will have flash arrestors at the torch and at the gauges. This is a mandatory KBR requirement.

1.14.8 Hoisting and Lifting

Subcontractor is responsible for providing its own equipment to include all hoisting; lifting, loading and unloading equipment required to perform its Scope-of-Work.

Subcontractor shall furnish crane/equipment certifications and lift plan for material lifts.

1.14.9 Assured Grounding Program

Subcontractor is responsible for implementing and maintaining the GFCI and Assured Grounding program for all electrical equipment, tools, and cords for the entire duration of the project.

1.15 PERMITS

KBR is responsible for obtaining any required state/local building permit only. Subcontractor is responsible for obtaining all other permits required by the project inclusive of permits required for installation and operation of fuel systems and generator(s) if required by state, county, or local regulation. The cost and fees associated with permits are the responsibility of the subcontractor. Submit a copy of all permits to KBR within 3 days of issuance.

Ownership of the new fuel storage tank and 35-kW engine generator set shall be retained by FEMA. For purposes of registration application or notification, as applicable, the owner’s information is:

Federal Emergency Management Agency
C/O: Walter Florence, IPAWS Program Manager
500 C Street SW, Room 506
Washington, DC 20472

Phone: 202-646-3169.

1.16 UNDERGROUND UTILITIES COORDINATION DRAWING

Within three working days after locating existing underground utilities, Subcontractor shall prepare and submit to KBR, a site layout coordination drawing. The drawing shall indicate proposed routing of new underground mechanical and electrical utilities; crossing points with existing infrastructure, and location of new pull boxes, hand holes, sumps, ground rods, test pits, etc. Once agreed upon, the

drawing will serve a key document for the underground utility preparatory meeting which is required prior to the start of underground work.

1.17 PURCHASE ORDERS

For all materials with a lead-time greater than three (3) weeks, Subcontractor shall, within 3 calendar days after submittal approval, submit one copy of the purchase order and confirmation of delivery date. The proposed construction schedule for the project shall reflect procurement plans for materials with a lead-time greater than three (3) weeks. Lead-time shall encompass all activities from the date of submittal approval until actual receipt onsite.

1.18 SEVERE WEATHER

In the event of a severe storm warning, the Contractor must:

a. Secure outside equipment and materials and place materials that could be damaged in protected areas.

b. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.

c. Ensure that temporary erosion controls are adequate.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 SUPPLEMENTAL WORK REQUIREMENTS

3.1.1 Mechanical and Electrical Support during work by others

Subcontractor shall provide mechanical and electrical labor support during start-up and testing of the fuel system, generator(s), and broadcasting equipment by others.

3.1.2 Pre-Final and Final Inspection

Upon completion of all testing activities and topping off of the fuel system, pressure wash the aboveground fuel storage tank and provide up to eight hours of paint touch-up on the fuel tank. Paint for touch-up work shall be supplied by KBR.

The day prior to final inspection of the project by the Government, subcontractor shall provide a final cleaning of the inside of both the generator and transmitter module buildings. The final cleaning shall include wiping all horizontal and vertical surfaces with an all purpose cleaner that is compatible with the surfaces being cleaned. Provide product data and installation instructions for a floor stripper and wax that is compatible with VCT. Strip, wax with three coats, and buff VCT flooring.

During the pre-final and final inspections of the project by the Government, Subcontractor shall provide mechanical and electrical labor support capable of readily correcting any deficiencies noted.

After final inspection by the Government, relocate the spare air conditioning units and cart from the transmitter module to the generator module.

3.2 PROTECTION OF LAND RESOURCES

The land resources, including trees and shrubs, within the project boundaries and outside the limits of permanent work performed under this project shall be preserved in their present condition or be restored to a condition after completion of construction that will appear to be natural and not detract from the appearance of the project. The Subcontractor shall confine his/her construction activities to areas defined by the plans or specifications.

Subcontractor shall obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, and stockpiles of excess or waste materials upon completion of construction. Subcontractor shall restore the construction area to near natural conditions that will permit the growth of vegetation.

3.3 PROTECTION OF WATER RESOURCES

Subcontractor shall not pollute lakes, ditches, rivers, bayous, canals, groundwater, waterways, or reservoirs with fuels, oils, bitumens, calcium chloride, insecticides, herbicides, or other similar materials harmful to fish, shellfish, or wildlife, or outdoor recreation.

Subcontractor shall furnish, install and maintain on a daily basis; erosion and sedimentation control barriers, silt fences, stabilized construction entrance and turbidity barriers required by the local codes and ordinances including the US Army Corps of Engineers, Department of Environmental Protection, and Water Management District having jurisdiction. The Subcontractor shall remove all erosion and sedimentation control at the end of the Project or as directed by KBR.

3.4 PROTECTION OF FISH AND WILDLIFE

The Subcontractor shall at all times perform all work and take such steps required to prevent any interference of disturbance to fish and wildlife. The Contractor will not be permitted to alter water flows or otherwise disturb native habitat adjacent to the project area that are critical to fish or wildlife.

3.5 DISPOSAL OF NON-REGULATED DEBRIS

All debris resulting from construction operations on this contract shall be disposed of in accordance with local, state, and federal regulations.

3.6 DISPOSAL OF HAZARDOUS AND/OR REGULATED SOLID WASTES

If any hazardous or regulated solid wastes will be generated as a result of the Subcontractor's operations, the Subcontractor shall submit a plan that details the proper handling, removal, transportation and disposal of such wastes. The plan shall identify what types of hazardous and/or regulated solid wastes will be generated and shall list the hazards involved with each waste. All waste generated on-site by the Contractor must be properly identified within 15 days of generation. No regulated wastes shall be allowed to accumulate on-site for more than 90 days. The plan shall include Material Safety Data Sheets (MSDS), if applicable, for all wastes expected to be generated. The plan shall include, but not be limited to the following:

(a) Hazardous waste shall be place in closed containers and shall be shielded adequately to prevent dispersion of the waste by wind or water. Any evidence of improper storage shall be cause for immediate shutdown of the project until corrective action is taken.

(b) Nonhazardous waste shall be stored in containers separate from hazardous waste storage areas.

(c) All nonhazardous waste shall be transported in accordance with local regulations regarding waste transportation.

(d) The plan shall identify what types of hazardous and/or regulated solid wastes will be generated and shall list the hazards involved with each waste.

SECTION 01 33 00.00 50

SUBMITTALS & QUALITY CONTROL

(05/24/11)

PART 1 GENERAL

Work performed under this project is governed by KBR's Quality Control Program and will follow the three phases of control for each definable feature of the construction work. Subcontractor shall support this program through active participation in preparatory, initial, and follow-up phase inspections for each definable feature of work. Subcontractor is responsible for quality control of its work.

KBR's Quality Control Manager is responsible for implementing the site specific Contractor Quality Control Plan. Under the plan, each Subcontractor has a key role in achieving quality results. This section defines roles and responsibilities of KBR and subcontractors and sets forth procedures applicable to the work.

1.1 SUBMITTALS

SD-02 Shop Drawings

As-Built Drawings

Submit two (2) sets of Red-Line as-built drawings showing final as-built conditions of the project.

SD-06 Test Reports

Prior to final inspection, all reports for testing shall be submitted to and approved by KBR as specified in applicable technical specification sections.

SD-10 Operation and Maintenance Manuals

Operation and maintenance manuals shall be submitted to and approved by KBR where specified in applicable technical specification sections. Operation and Maintenance manuals shall be organized per paragraph 1.8 and submitted within 5 days of equipment being delivered to site. Operation and maintenance manuals provided in a common volume shall be clearly differentiated and shall be separately indexed.

1.2 SUBMITTAL DEFINITIONS

1.2.1 Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by Submittal Description (SD) numbers and titles as follows:

SD-01 Preconstruction Submittals

Submittals which are required prior to commencing work on site or the start of the next definable feature of work and includes schedules, tabular list of data, or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work.

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work and include diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

SD-04 Samples

Fabricated or unfabricated physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

SD-05 Design Data

Design calculations, mix designs, analyses or other data pertaining to a part of work and includes

Design submittals, design substantiation submittals and extensions of design submittals.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements and includes report which document finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Daily logs and checklists.

Final acceptance test and operational test procedure.

SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification

requirements. Must be dated after award of project contract and clearly name the project.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and (MSDS) concerning impedances, hazards and safety precautions.

SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must be signed by an authorized official of a testing laboratory or agency and must state the test results; and indicate whether the material, product, or system has passed or failed the test.

SD-10 Operation and Maintenance Data

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel, including manufacturer's help and product line documentation necessary to maintain and install equipment. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

This data is intended to be incorporated in an operations and maintenance manual or control system.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to properly close out a construction contract and includes Record Drawings and As-built drawings.

1.2.2 Approving Authority

Office or designated person authorized to approve a submittal. For the sublet work designated approval authorities are the KBR Quality Control Manager or the Designer of Record (DOR).

1.2.3 Work

As used in this section, work includes on- and off-site construction required by contract documents.

1.3 PREPARATION

1.3.1 Transmittal Form

Transmit each submittal to the KBR Lead Document Control Specialist, Mario Canlas (Mario.Canlas@kbr.com) for subsequent processing. Transmit submittals with a transmittal form. On the transmittal form identify subcontractor, indicate date of submittal, and include information

prescribed by transmittal form and required in paragraph entitled, "Identifying Submittals," of this section. E-mail attachment size must not exceed 10 Megabytes.

1.3.2 Identifying Submittals

Submittals that do not contain the required information will be returned.

Identify submittals with the following information permanently adhered to or noted on each separate component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

a. Project title and location.

b. Subcontract number.

c. Date of the drawings and revisions.

d. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other subcontractor associated with the submittal.

e. Section number of the specification section by which submittal is required.

f. Submittal description (SD) number of each component of submittal.

g. When a resubmission, add alphabetic suffix on submittal description, for example, submittal 18 would become 18A, to indicate resubmission.

h. Pertinent data shall be highlighted on catalog cut sheets or manufacturer's data sheets to clearly show the item being submitted. If the specifications require an item or material to meet a certain industry standard (i.e., ANSI, WWP, U.L., etc.), the submittal for that item shall so indicate that it meets that specification or a letter of conformance from the manufacturer shall be provided.

i. Product identification and location in project.

1.4 Identifying Lower Tier Subcontractor Submittals

When submittals are provided by a lower tier subcontractor, Subcontractor is to prepare, review and indicate subcontractor's approval on all specified submittals prior to submitting for KBR approval.

1.5 Variations

When proposing variation, deliver written request to KBR, with documentation of the nature and features of the variation, why the variation is desirable and beneficial to the project and warrant that the variation, if incorporated, will be compatible with other elements of the work. If lower cost is a benefit, also include an estimate of the cost savings. In addition to documentation required for variation, include the

submittals required for the item. Upon receipt of such request, with concurrence, KBR will submit to the DOR for written analysis. If the DOR concurs, KBR will forward to the Government for approval.

Clearly mark the proposed variation in all documentation.

1.6 Submittal Register

A submittal register showing items for which submittals are required is provided as an attachment. This list may not be all inclusive and additional submittals may be required. KBR's Quality Control Manager will coordinate submittal requirements with the Subcontractor. KBR's Lead Document Control Specialist will track all submittals including dates on which submittals are received from the Subcontractor, returned by the DOR, and returned by KBR. Subcontractor is responsible for timely and accurate submittal submissions to ensure project progress as scheduled by the subcontractor.

1.7 Submittal Scheduling

Subcontractor shall coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. As a minimum Subcontractor shall allow at least 3 working days for KBR QC Manager submittal review and approval and 7 working days for submittals requiring DOR approval. In the event a resubmittal is required to satisfy contract requirements, subcontractor shall submit a schedule recovery plan with the submittal if impact delays are anticipated. Period of review for each resubmittal is the same as for the initial submittal.

1.8 Quantity of Submittals Required

SD-01 Preconstruction Submittals – 1 electronic file in PDF format

SD-02 Shop Drawings – 1 electronic file in PDF format

SD-03 Product Data – 1 electronic file in PDF format

SD-04 Samples / Color Charts– 5 each

SD-05 Design Data – 1 electronic file in PDF format

SD-06 Test Reports – 1 electronic file in PDF format

SD-07 Certifications – 1 electronic file in PDF format

SD-08 Manufacturer's Instructions – 3 hard copies, 3 CDs in PDF format

SD-09 Manufacturer's Field Reports – 1 electronic file in PDF format

SD-10 Operation and Maintenance Data – 3 hard copies, 3 CDs in PDF format

SD-11 Closeout Submittals (As-Builts) – 2 copies

1.9 Submittal Review Action Codes

The following action codes will be used to indicate the results of review:

AN - Approved as noted

A - Approved as submitted

B - Approved, except as noted

C - Approved, resubmission required

D - Returned by correspondence

E - Disapproved (See attached), resubmission required

F - Receipt acknowledged

X - Receipt acknowledged, does not comply, resubmission required

1.10 Submittal Constraints

Submit complete submittals for each definable feature of work. Submit at the same time components of definable feature interrelated as a system.

When acceptability of a submittal is dependent on conditions, items, or materials included in separate subsequent submittals, submittal will be returned without review.

Approval of a separate material, product, or component does not imply approval of assembly in which item functions.

1.11 Operation and Maintenance Manuals

Include specific instructions, procedures, and illustrations for the installed model and features of each system. Organize and index as follows:

- Warranty Registration and Warranty
- Safety Precautions
- Startup, Shutdown, and Post-Shutdown Procedures
- Normal Operations
- Emergency Operations
- Operator Service Requirements (lubrication, adjustment, etc.)
- Preventive Maintenance Plan and Schedule (weekly, monthly, annual)
- Troubleshoot Guides and Diagnostic Techniques
- Wiring and Control Diagrams
- List of tools required for maintenance and repair
- Manufacturer's Recommended Spare Parts with List of Suppliers
- Completed Startup and Testing Documentation

1.12 Close Out Submittals

1.12.1 Red-Line Drawings

Subcontractor shall maintain, on-site, 2 full size sets of accurately detailed red-line drawings indicating any changes, deviations, actual dimensions, locations and elevations of underground conduits, any existing antenna tower grounding radials, cables, piping, storm drains, manholes, pull boxes, or any other underground structure uncovered by required exploratory excavations, and any field modifications. Newly installed underground utilities must be dimensioned in depth below grade and from fixed surface structures. Drawings marked to reflect as-built conditions shall not be used for other than intended purpose. Dirty, torn drawings, or incomplete drawings will be rejected. Red-Line drawings will be reviewed weekly and are a condition of Pay Applications. Red-Line drawings shall be submitted and approved prior to Final Acceptance Inspection.

1.12.2 Test Reports

Written reports documenting testing required by technical specification sections shall be submitted within one week after conclusion of the test.

1.12.3 Operation and Maintenance Manuals

Operation and maintenance manuals shall be submitted to and approved by KBR where specified in applicable technical specification sections within 5 days of equipment being delivered to site.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 KBR Quality Control

KBR's Quality Control System is the means by which KBR ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. KBR's QC Manager uses the three phases of control approach for each definable feature of the construction work. Subcontractor is responsible for participation in the control process as described below.

3.1.1 Preparatory Phase

This phase is performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved or accepted, and after copies are at the work site. During this phase, KBR's QC Manager will, with the subcontractor's crew, review of the applicable project specification sections and drawings; check to assure all materials and / or equipment is as submitted and approved for use; examine the work area to assure that all prerequisite and preliminary work is complete and is in compliance with the contract; review the appropriate activity hazard analysis to assure safety requirements are met; discuss procedures for controlling quality of the work, tolerances, and workmanship standards for that feature of work.

3.1.2 Initial Phase

This phase is accomplished at the beginning of a definable feature of work. During this phase, the KBR QC Manager will, with subcontractor's Supervisor, check work to ensure that it is in full compliance with contract requirements; verify adequacy of controls to ensure full contract compliance; verify required control inspection and testing; establish level of workmanship and verify that it meets minimum acceptable workmanship standards; and resolve all differences. During this phase, the KBR QC Manager will check safety to include compliance with the safety plan and activity hazard analysis. The initial phase will be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3.1.3 Follow-Up Phase

This phase involves daily checks by the KBR QC Manager and subcontractor's Supervisor to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. A final follow-up check will be made with any and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. Non-conforming work shall not be built upon nor concealed.

3.1.4 Unsatisfactory or Non-Conforming Work

Work performed by subcontractor determined to be unsatisfactory or non-conforming, shall be removed and replaced or otherwise corrected by means acceptable to KBR within 24 hours.

3.2 Subcontractor's Daily Report

Subcontractor shall submit a Subcontractor’s Daily report to the KBR QC Manager by 10:00 a.m. the business day following the day the work is performed. KBR will supply subcontractor the form for this purpose. Subcontractor is responsible to provide complete and accurate information.

3.3 FIELD TESTING

3.3.1 Independent Test Lab for Soils, Concrete, and Asphalt

Subcontractor shall provide the services of an independent test lab for all required inspection and testing for soils, concrete, and asphalt per the structural drawings and specifications. For bid purposes, assume sub-grade and fill compaction tests are to be performed at a frequency of not less than one test per 2,500 square feet per lift in each slab area, or a minimum of two test locations in each slab, whichever is greater; and every 100 lineal feet in wall footings. For bid purposes, assume concrete / grout slump test frequency at one test per mix design per pour per day. KBR shall be provided one copy of each batch ticket attached to the daily report for the day the concrete was placed.

3.3.2 Testing shall include, but not limited to, fencing, plumbing, and electrical systems shall be as specified in applicable technical specification sections. Subcontractor shall give KBR 48 hour advance notice of testing.

3.3.3 Phase Rotation of Check of Transmitter Module HVAC unit

In addition to requirements indicated in Section 26 05 00.00 40 paragraph 3.8, subcontractor shall check phase rotation of the HVAC unit in the transmitter module under the conditions of building and generator power to ensure correct phasing – adjust if necessary.

3.4 COMPLETION INSPECTION

3.4.1 Punch-Out Inspection

The KBR QC Manager and subcontractor's supervisor will conduct a joint inspection of each definable feature of work near the end of the work and prepare a punch list of items which do not conform to the approved drawings and specifications. In the event there is non conforming work and the non-conformity cannot be corrected within 24 hours, subcontractor shall submit a schedule by which all non-conformities will be corrected. A second joint inspection will be made to ascertain all deficiencies have been corrected. Once this is accomplished, the KBR QC Manager will notify the Government that the facility is ready for the Government Pre-Final inspection.

3.4.2 Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. In general, the Government will conduct their Pre-Final Inspection on day 2 of System Integration Testing. A Government Pre-Final Punch List may be developed as a result of this inspection. KBR will ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Subcontractor shall correct any items noted on the Pre-Final inspection in a timely manner. These inspections and any deficiency corrections required by this paragraph must be accomplished within the time slated for completion of the entire work.

3.4.3 Final Acceptance Inspection

KBR's QC Manager shall request final acceptance inspection by the Government based on mutual understanding with subcontractor's Supervisor. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. KBR's QC Manager and subcontractor's Supervisor are required to attend the Final Acceptance Inspection.

- - END OF SECTION - -

SECTION 03 30 53

MISCELLANEOUS CAST-IN-PLACE CONCRETE
04/08

PART 1 GENERAL

1.1 SUMMARY

Perform all work in accordance with ACI MCP SET Parts 2 and 3.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACI INTERNATIONAL (ACI)

ACI MCP SET	(2009) Manual of Concrete Practice

ASTM INTERNATIONAL (ASTM)

ASTM A 185/A 185M	(2007) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A 615/A 615M	(2009) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C 1064/C 1064M	(2008) Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C 143/C 143M	(2009) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C 150/C 150M	(2009) Standard Specification for Portland Cement
ASTM C 171	(2007) Standard Specification for Sheet Materials for Curing Concrete

ASTM C 172	(2008) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C 231	(2009a) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 309	(2007) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 31/C 31M	(2009) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C 33/C 33M	(2008) Standard Specification for Concrete Aggregates
ASTM C 39/C 39M	(2005e1e2) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C 494/C 494M	(2008a) Standard Specification for Chemical Admixtures for Concrete
ASTM C 618	(2008a) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C 685/C 685M	(2007) Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C 94/C 94M	(2009) Standard Specification for Ready-Mixed Concrete

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete

1.3 SYSTEM DESCRIPTION

The Government retains the option to sample and test aggregates and concrete to determine compliance with the specifications. Sample concrete in accordance with ASTM C 172. Determine slump and air content in accordance with ASTM C 143/C 143M and ASTM C 231, respectively, when cylinders are molded. Prepare, cure, and transport compression test specimens in accordance with ASTM C 31/C 31M. Test compression test specimens in accordance with ASTM C 39/C 39M. Take samples for strength tests not less than once each shift in which concrete is produced. Provide a minimum of four specimens from each sample; two to be tested at 28 days for acceptance, and two will be tested at 5 days for information to allow equipment placement on foundations.

1.3.1 Strength

Acceptance test results are the average strengths of two specimens tested at 28 days. The strength of the concrete is considered satisfactory so long as the average of three consecutive acceptance test results equal or exceed 4,000 psi, and no individual acceptance test result falls below f'c

by more than 500 psi. The specified compressive strength f'c of 5,000 psi at 28 days is being specified to allow earlier setting of modules and equipment. The 5 day test of compressive strength shall be a minimum of 2,500 psi in order to allow setting of modules or empty equipment no earlier than 7 days following placement of the foundation.

1.3.2 Construction Tolerances

Apply a Class "C" finish to all surfaces except those specified to receive a Class "D" finish. Apply a Class "D" finish to all post-construction surfaces which will be permanently concealed. Surface requirements for the classes of finish required are as specified in Part 4 of ACI MCP SET.

1.3.3 Concrete Mixture Proportions

Concrete mixture proportions are the responsibility of the Contractor. Mixture proportions shall include the dry weights of cementitious material(s); the nominal maximum size of the coarse aggregate; the specific gravities, absorptions, and saturated surface-dry weights of fine and coarse aggregates; the quantities, types, and names of admixtures; and quantity of water per cubic yard of concrete. Provide materials included in the mixture proportions of the same type and from the same source as will be used on the project. Specified compressive strength f'c shall be 5,000 psi at 28 days. The maximum nominal size coarse aggregate is 3/4 inch, in accordance with ACI MCP SET Part 3. The air content shall be between 4.5 and 7.5 percent with a slump between 2 and 5 inches. The maximum water cement ratio is 0.50.

1.4 SUBMITTALS

The following submittals are required for approval:

SD-02 Shop Drawings

Reinforcing steel

Reproductions of contract drawings are unacceptable.

SD-06 Test Reports

Concrete Mixture Proportions

The mixture proportions that will produce concrete of the quality required, ten days prior to placement of concrete. Applicable test reports to verify that the concrete mixture proportions selected will produce concrete of the quality specified.

Compressive Strength Testing

SD-07 Certificates

Cementitious Materials

Manufacturer's certificates of compliance, accompanied by mill test reports, attesting that the concrete materials meet the requirements of the specifications in accordance with the Special

Clause "CERTIFICATES OF COMPLIANCE".

Aggregates

Certificates of compliance stating that the material(s) meet the quality and grading requirements of the specifications under which it is furnished.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Cementitious Materials

Provide cementitious materials that conform to the appropriate specifications listed:

2.1.1.1 Portland Cement

ASTM C 150/C 150M, Type I or II.

2.1.1.2 Fly Ash

Provide fly ash that conforms to ASTM C 618, Class C or F, including requirements of Tables 1A and 2A.

2.1.2 Aggregates

Fine and coarse aggregates shall meet the quality and grading requirements of ASTM C 33/C 33M Class Designations 4M or better.

2.1.3 Admixtures

Admixtures to be used, when required or approved, shall comply with the appropriate specification listed. Retest chemical admixtures that have been in storage at the project site, for longer than 6 months or that have been subjected to freezing, at the expense of the Contractor at the request of the Site Manager and will be rejected if test results are not satisfactory.

2.1.4 Water

Use fresh, clean, potable water for mixing and curing, free from injurious amounts of oil, acid, salt, or alkali, except that unpotable water may be used if it meets the requirements of COE CRD-C 400.

2.1.5 Reinforcing Steel

Provide reinforcing bars conforming to the requirements of ASTM A 615/A 615M, Grade 60. Welded steel wire fabric shall conform to the requirements of ASTM A 185/A 185M. Details of reinforcement not shown shall be in accordance with ACI MCP SET Part 3, Chapters 7 and 12.

2.1.6 Form Coatings

Coat forms, for exposed surfaces, with a nonstaining form oil to be applied shortly before concrete is placed.

2.1.7 Curing Materials

Provide curing materials conforming to the following requirements.

2.1.7.1 Impervious Sheet Materials

Impervious sheet materials, ASTM C 171, type optional, except polyethylene film, if used, shall be white opaque.

2.1.7.2 Membrane-Forming Curing Compound

ASTM C 309, Type 1-D or 2, Class A.

2.2 READY-MIX CONCRETE

a. Concrete shall be ready-mix concrete with mix design data conforming to ACI MCP SET Part 2.

b. Concrete foundations and pedestals: 5000 psi minimum compressive strength as determined in 28 calendar days.

c. Slump: 2 to 5 inch according to ASTM C 143/C 143M and ACI MCP SET Part 1.

d. Water-reducing admixtures, retarding admixtures, accelerating admixtures, water-reducing and accelerating admixtures, and water-reducing and retarding admixtures shall conform to ASTM C 494/C 494M.

e. Fly Ash used as an admixture shall conform to ASTM C 618, Class C or F with 4 percent maximum loss on ignition and 35 percent maximum cement replacement by weight.

2.3 STEEL REINFORCEMENT

2.3.1 Deformed Steel Bars

Provide steel bars conforming to ASTM A 615/A 615M, Grade 60 ksi ACI MCP SET Parts 2 and 3.

2.4 FORMS

Forms shall be of wood, steel, or other approved material and conform to ACI MCP SET, Parts 2 and 3.

Provide form release conforming to ACI MCP SET, Part 4.

PART 3 EXECUTION

3.1 PREPARATION

Construct ramps and walkways, as necessary, to allow safe and expeditious access for concrete and workmen. Earth foundations shall be satisfactorily compacted. Ensure spare vibrators are available. The entire preparation shall be accepted by the Site Manager prior to placing.

3.1.1 Embedded Items

Secure reinforcement in place after joints, anchors, and other embedded

items have been positioned. Arrange internal ties so that when the forms are removed the metal part of the tie is not less than 2 inches from concrete surfaces permanently exposed to view or exposed to water on the finished structures. Embedded items shall be free of oil and other foreign matters such as loose coatings or rust, paint, and scale. All equipment needed to place, consolidate, protect, and cure the concrete shall be at the placement site and in good operating condition.

3.1.2 Formwork Installation

Forms shall be properly aligned, adequately supported, and mortar-tight. Provide smooth form surfaces, free from irregularities, dents, sags, or holes when used for permanently exposed faces. Chamfer all exposed joints and edges, unless otherwise indicated.

3.1.3 Production of Concrete

3.1.3.1 Ready-Mixed Concrete

Provide ready-mixed concrete conforming to ASTM C 94/C 94M except as otherwise specified.

3.1.3.2 Concrete Made by Volumetric Batching and Continuous Mixing

Concrete made by volumetric batching and continuous mixing shall conform to ASTM C 685/C 685M.

3.2 CONVEYING AND PLACING CONCRETE

Concrete placement is not permitted when weather conditions prevent proper placement and consolidation without approval. When concrete is mixed and/or transported by a truck mixer, deliver the concrete to the site of the work completing the discharge within 1-1/2 hours or 45 minutes when the placing temperature is 86 degrees F or greater unless a retarding admixture is used. Convey concrete from the mixer to the forms as rapidly as practicable by methods which prevent segregation or loss of ingredients. Concrete shall be in place and consolidated within 15 minutes after discharge from the mixer. Deposit concrete as close as possible to its final position in the forms and regulate it so that it may be effectively consolidated in horizontal layers 18 inches or less in thickness with a minimum of lateral movement. Carry on the placement at such a rate that the formation of cold joints will be prevented. Perform conveying and placing concrete in conformance with the following requirements.

3.2.1 Consolidation

Consolidate each layer of concrete by internal vibrating equipment. Systematically accomplish internal vibration by inserting the vibrator through the fresh concrete in the layer below at a uniform spacing over the entire area of placement. The distance between insertions shall be approximately 1.5 times the radius of action of the vibrator and overlay the adjacent, just-vibrated area by approximately 4 inches. Ensure that the vibrator penetrates rapidly to the bottom of the layer and at least 6 inches into the layer below, if such a layer exists. Hold vibrator stationary until the concrete is consolidated and then withdraw it slowly at the rate of about 3 inches per second.

3.2.2 Cold-Weather Requirements

No concrete is to be mixed or placed when the ambient temperature is below 36 degrees F or if the ambient temperature is below 41 degrees F and falling. Provide suitable covering and other means as approved for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing and at a temperature above freezing for the remainder of the curing period. Do not mix salt, chemicals, or other foreign materials with the concrete to prevent freezing. Remove and replace concrete damaged by freezing at the expense of the Contractor.

3.2.3 Hot-Weather Requirements

When the rate of evaporation of surface moisture, as determined by use of Figure 1 of ACI MCP SET Part 2, is expected to exceed 0.2 psf per hour, provisions for windbreaks, shading, fog spraying, or covering with a light-colored material shall be made in advance of placement, and such protective measures taken as quickly as finishing operations will allow.

3.3 FORM REMOVAL

Do not remove forms before 24 hours after concrete placement, except as otherwise specifically authorized. Do not remove supporting forms and shoring until the concrete has cured for at least 5 days. When conditions require longer curing periods, forms shall remain in place.

3.4 FINISHING

3.4.1 Temperature Requirement

Do not finish or repair concrete when either the concrete or the ambient temperature is below 50 degrees F.

3.4.2 Finishing Formed Surfaces

Remove all fins and loose materials, and surface defects including filling of tie holes. Repair all honeycomb areas and other defects. Remove all unsound concrete from areas to be repaired. Surface defects greater than 1/2 inch in diameter and holes left by removal of tie rods in all surfaces not to receive additional concrete shall be reamed or chipped and filled with dry-pack mortar. Brush-coat the prepared area with an approved epoxy resin or latex bonding compound or with a neat cement grout after dampening and filling with mortar or concrete. The cement used in mortar or concrete for repairs to all surfaces permanently exposed to view shall be a blend of portland cement and white cement so that the final color when cured is the same as adjacent concrete.

3.4.3 Finishing Unformed Surfaces

Float finish all unformed surfaces, that are not to be covered by additional concrete or backfill, to elevations shown, unless otherwise specified. Surfaces to receive additional concrete or backfill shall be brought to the elevations shown and left as a true and regular surface. Finish unformed surfaces to a tolerance of 3/8 inch for a float finish as determined by a 10 foot straightedge placed on surfaces shown on the drawings to be level or having a constant slope. Do not perform finishing while there is excess moisture or bleeding water on the surface. No water or cement is to be added to the surface during finishing.

3.4.3.1 Float Finish

Provide float finished surfaces, screeded and darbied or bullfloated to eliminate the ridges and to fill in the voids left by the screed. In addition, the darby or bullfloat shall fill all surface voids and only slightly embed the coarse aggregate below the surface of the fresh concrete. When the water sheen disappears and the concrete supports a person's weight without deep imprint, complete floating. Floating shall embed large aggregates just beneath the surface, remove slight imperfections, humps, and voids to produce a plane surface, compact the concrete, and consolidate mortar at the surface.

3.4.3.2 Broom Finish

Apply a broom finish to slabs and pads. Screed and float the concrete to required finish plane with no coarse aggregate visible. After surface moisture disappears, broom or brush the surface with a broom or fiber bristle brush in a direction transverse to that of the main traffic or as directed.

3.5 CURING AND PROTECTION

Beginning immediately after placement, and continuing for at least 7 days, cure and protect all concrete from premature drying, extremes in temperature, rapid temperature change, freezing, mechanical damage, and exposure to rain or flowing water. Provide all materials and equipment needed for adequate curing and protection at the site of the placement prior to the start of concrete placement. Accomplish moisture preservation of moisture for concrete surfaces not in contact with forms by one of the following methods:

a. Continuous sprinkling or ponding.

b. Application of absorptive mats or fabrics kept continuously wet.

c. Application of impervious sheet material conforming to ASTM C 171.

d. Application of membrane-forming curing compound conforming to ASTM C 309, Type 1-D, on surfaces permanently exposed to view. Accomplish Type 2 on other surfaces in accordance with manufacturer's instructions.

Accomplish the preservation of moisture for concrete surfaces placed against wooden forms by keeping the forms continuously wet for 7 days. If forms are removed prior to end of the required curing period, use other curing methods for the balance of the curing period. Do not perform protection removal if the temperature of the air in contact with the concrete may drop more than 60 degrees F within a 24 hour period.

3.6 TESTS AND INSPECTIONS

3.6.1 Field Testing Technicians

The individuals who sample and test concrete, as required in this specification, shall have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI minimum guidelines for certification of Concrete Field Testing Technicians, Grade I.

3.6.2 Inspection Details and Frequency of Testing

3.6.2.1 Preparations for Placing

Inspect foundation or construction joints, forms, and embedded items in sufficient time prior to each concrete placement by the Contractor to certify that it is ready to receive concrete.

3.6.2.2 Slump

Check slump once during each shift that concrete is produced. Obtain samples in accordance with ASTM C 172 and tested in accordance with ASTM C 143/C 143M.

3.6.2.3 Consolidation and Protection

Ensure that the concrete is properly consolidated, finished, protected, and cured.

3.6.3 Action Required

3.6.3.1 Placing

Do not permit placing to begin until the availability of an adequate number of acceptable vibrators, which are in working order and have competent operators, has been verified. Do not continue placing if any pile is inadequately consolidated.

3.6.3.2 Slump

Whenever a slump test result is outside the specification limits, adjust the batch weights of water and fine aggregate prior to delivery of concrete to the forms. The adjustments are to be made so that the water-cement ratio does not exceed that specified in the submitted concrete mixture proportion.

3.6.4 Reports

Report the results of all tests and inspections conducted at the project site informally at the end of each shift. Submit written reports weekly. Deliver within 3 days after the end of each weekly reporting period.

3.7 FORM WORK

Form work shall conform to ACI MCP SET Parts 2 through 5.

3.7.1 Preparation of Form Surfaces

Forms shall be true to line and grade, mortar-tight, and sufficiently rigid to prevent objectionable deformation under load. Form surfaces for permanently exposed faces shall be smooth, free from irregularities, dents, sags, or holes. Chamfer exposed joints and exposed edges. Arrange internal ties so that when the forms are removed, the form ties are not less than 2 inches from concrete surfaces permanently exposed to view or exposed to water on the finished structure.

3.7.2 Form Coating

Coat forms, for exposed surfaces, with a nonstaining form release coating

applied. Forms for unexposed surfaces may be wetted in lieu of coating immediately before the placing of concrete, except that in freezing weather form release coating shall be used.

3.8 STEEL REINFORCING

Reinforcement shall be free from loose, flaky rust and scale, and free from oil, grease, or other coating which might destroy or reduce the reinforcement's bond with the concrete.

3.8.1 Fabrication

Shop fabricate steel reinforcement in accordance with ACI MCP SET Parts 2 and 3. Shop details and bending shall be in accordance with ACI MCP SET Parts 2 and 3.

3.8.2 Splicing

Perform splices in accordance with ACI MCP SET Parts 2 and 3.

3.8.3 Supports

Secure reinforcement in place by the use of metal or concrete supports, spacers, or ties.

3.9 EMBEDDED ITEMS

Before placing concrete, take care to determine that all embedded items are firmly and securely fastened in place. Provide embedded items free of oil and other foreign matter, such as loose coatings of rust, paint and scale. Embedding of wood in concrete is permitted only when specifically authorized or directed.

3.10 FIELD TESTING

a. Provide samples and test concrete for quality control during placement. Sampling of fresh concrete for testing shall be in accordance with ASTM C 172.

b. Test concrete for compressive strength at 5 and 28 days for each design mix. Concrete test specimens shall conform to ASTM C 31/C 31M. Perform Compressive strength testing conforming to ASTM C 39/C 39M.

c. Test Slump at the site of discharge for each design mix in accordance with ASTM C 143/C 143M.

d. Determine temperature of concrete at time of placement in accordance with ASTM C 1064/C 1064M.

-- End of Section --

SECTION 05 12 00

STRUCTURAL STEEL
02/12

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 325	(2005) Steel Construction Manual
AISC 326	(2009) Detailing for Steel Construction
ANSI/AISC 341	(2005; Suppl No. 1 2005) Seismic Provisions for Structural Steel Buildings
ANSI/AISC 360	(2005) Specification for Structural Steel Buildings

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2007) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1/D1.1M	(2010) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M	(2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 325	(2009a) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A 500/A 500M	(2009) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 53/A 53M	(2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 563	(2007a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A 780/A 780M	(2009) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A 992/A 992M	(2006a) Standard Specification for Structural Steel Shapes
ASTM F 436	(2009) Hardened Steel Washers

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926.756	Steel Erection; Beams and Columns

1.2 SYSTEM DESCRIPTION

Provide the structural steel system, including galvanizing, complete and ready for use. Structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing shall be provided in accordance with ANSI/AISC 360 and ANSI/AISC 341 except as modified in this contract.

1.3 SUBMITTALS

Approval is required for the following submittals:

SD-02 Shop Drawings

Fabrication drawings including description of connections

1.4 QUALITY ASSURANCE

1.4.1 Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 326 and AISC 325. Fabrication drawings shall not be reproductions of contract drawings. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Double connections that require an erection seat to comply with OSHA 29 CFR 1926.756(c)(1) shall be shown on the shop drawings, reviewed and approved by the structural engineer of record. Use AWS A2.4 standard welding symbols. Member substitutions of details shown on the contract drawings shall be clearly

highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

PART 2 PRODUCTS

2.1 STEEL

2.1.1 Structural Steel

All channels, angles, and plates shall conform to ASTM A 36/A 36M.

2.1.2 High-Strength Structural Steel

2.1.2.1 Low-Alloy Steel

All wide flanged shapes shall conform to ASTM A 992/A 992M Grade 50.

2.1.3 Structural Steel Tubing

ASTM A 500/A 500M, Grade B.

2.1.4 Steel Pipe Bollards

ASTM A 53/A 53M, Type S, Grade B, weight class STD (Standard), painted.

2.2 BOLTS, NUTS, AND WASHERS

Provide the following unless indicated otherwise.

2.2.1 High-Strength Structural Steel, Structural Steel and Tubing

2.2.1.1 Bolts

ASTM A 325, Type 1, Mechanically galvanized

2.2.1.2 Nuts

ASTM A 563, Grade and Style as specified in the applicable ASTM bolt standard, and mechanically galvanized.

2.2.1.3 Washers

ASTM F 436, plain carbon steel, and mechanically galvanized.

2.3 STRUCTURAL STEEL ACCESSORIES

2.3.1 Welding Electrodes and Rods

AWS D1.1/D1.1M.

2.4 GALVANIZING

ASTM A 123/A 123M or ASTM A 153/A 153M, as applicable, unless specified otherwise galvanize after fabrication where practicable.

PART 3 EXECUTION

3.1 FABRICATION

Fabrication shall be in accordance with the applicable provisions of AISC 325. Fabrication and assembly shall be done in the shop to the greatest extent possible.

3.2 ERECTION

Erection of structural steel shall be in accordance with the applicable provisions of AISC 325. Provide for drainage in structural steel. After final positioning of steel members, provide full bearing under base plates and bearing plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions.

3.2.1 STORAGE

Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

3.3 CONNECTIONS

Except as modified in this section, connections not detailed shall be designed in accordance with ANSI/AISC 360. Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Punch, subpunch and ream, or drill bolt holes perpendicular to the surface of the member. Holes shall not be cut or enlarged by burning. Bolts, nuts, and washers shall be clean of dirt and rust, and lubricated immediately prior to installation.

3.3.1 Bearing Type Connections

All high strength bolted connections shall be bearing type connections except for braces, moment connections, hangers, or direct tension connectors. Bolts shall be tightened to a "snug tight" fit. "Snug tight" is the tightness that exists when plies in a joint are in firm contact. This may be obtained with a few impacts of an impact wrench, or the full effort of a man using a spud wrench.

3.3.2 Slip-Critical Connections

All high strength bolted connections for bracing, moment connections, hangers, and direct tension connectors shall be slip-critical connections. Bolts shall be fully tensioned to 70 percent of their minimum tensile strength using a tightening method defined by AISC.

3.4 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. Use of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the Engineer.

3.5 WELDING

Provide AWS D1.1/D1.1M qualified welders, welding operators, and tackers.

3.6 GALVANIZING REPAIR

Provide as indicated or specified. Galvanize after fabrication where practicable. Repair damage to galvanized coatings using ASTM A 780/A 780M zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

3.7 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing. The Site Manager shall be notified in writing of defective welds, bolts, nuts, and washers within 7 working days of the date of weld inspection.

3.7.1 Welds

3.7.1.1 Visual Inspection

AWS D1.1/D1.1M. Furnish the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections. Welding inspectors shall visually inspect and mark welds, including fillet weld end returns.

3.7.2 High-Strength Bolts

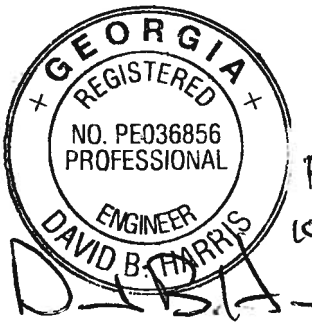
3.7.2.1 Inspection

Inspection procedures shall be in accordance with ANSI/AISC 360. Confirm and report to the Site Manager that the materials meet the project specification and that they are properly stored. Confirm that the faying surfaces have been properly prepared before the connections are assembled. Observe the specified job site testing and calibration, and confirm that the procedure to be used provides the required tension. Monitor the work to ensure the testing procedures are routinely followed on joints that are specified to be fully tensioned.

-- End of Section --

SECTION 23 10 20

FACILITY FUEL OIL SYSTEM
GAINESVILLE, GA



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PART 1 - GENERAL

1.01 SCOPE

A. Provide all services, labor, material, equipment, and supervision necessary to provide a completely functional fuel system per the following, attached drawings, and specifications. The system shall consist of one fuel storage system, one day-tank package, and associated fuel piping to three gen-sets.

1.02 WORK INCLUDED

A. This work consists of removing from service an existing underground storage tank, daytank, and associated piping; of receiving and installing a new fuel oil storage tank system; and of furnishing and installing a new fuel oil day tank package and a fuel oil piping system in accordance with these specifications, drawings, the manufacturer's recommended procedures, and other requirements as directed by the engineer. The storage tank and piping shall serve a new 35 kW primary generator mounted in a HEMP shielded module, and an existing genset located inside an existing building at the Gainesville Site.

1. Contractor shall remove fuel oil piping from existing daytank back to existing storage tank and dispose of in accordance with local and state regulations.
2. Contractor shall remove existing daytank and dispose of in accordance with local and state regulations.
3. Existing underground storage tank shall be permanently closed in-place by Contractor using the filling method in accordance with local, state, and federal regulations. Contractor shall empty storage tank and isolate from system. Contractor shall deliver removed fuel to a licensed recycle facility.
4. Contractor shall receive and install new owner-furnished fuel storage tank system. This fuel storage tank system shall be factory assembled and then shipped to site. Contractor shall install the system in accordance with system supplier's instructions. The fuel storage system will consist of a 8000 gallon double-wall aboveground fuel storage tank, ladder/platform system, remote fill box, fuel filtering system, control panels, instrumentation, accessories, fittings, piping, valves, and all necessary material to make the system fully functional . The complete system shall be factory assembled and tested prior to shipment to the transmitter site.

5. Contractor shall furnish and install a new fuel oil piping system (including underground double containment piping system) as described in the specifications and as shown on drawings.
6. Contractor shall furnish and install new 150 gallon day tank package as described in the specification and as shown on drawings.
7. Contractor shall provide interlock from the Day Tank Package Control Panel to supply line solenoid valve (SV-001). Solenoid valve is to open when Supply Pump is on and is to close when Supply Pump is off.

B. This work is to be performed in accordance with applicable federal, territorial, and local regulations including requirements of NFPA, EPA, OSHA, Fire Marshal, and all other relevant entities. All equipment and installation thereof shall be as per appropriate UFC, UL, NFPA Codes, and local regulations.

1.03 RELATED WORK DESCRIBED ELSEWHERE

A. Mechanical Plan, M-101

B. Mechanical Elevations, M-201

C. Mechanical Elevations, M-202

D. Pipe Support Details, M-501

E. Fuel System P&ID, M-601

F. Fuel System P&ID, M-602

G. Day Tank Package Specification, Section 23 10 30.

H. Supplier Submittal Data for the Fuel Oil Storage System, and HEMP Protected Gen-set Module. (All are Owner Furnished Items.)

1.04 GOVERNING STANDARDS / REFERENCES

Equipment and installation necessary to accomplish the work specified herein shall comply with the latest revisions of the applicable federal, state, and local codes and regulations concerning aboveground fuel storage systems and associated underground piping including but not limited to the following:

A. State of Georgia Department of Natural Resources (Environmental Protection Division).

B. Georgia, Mechanical Code.

C. International Code Council, International Mechanical Code.

D. Georgia State Office of Insurance and Safety Fire Commissioner.

E. U.S. EPA, Spill Prevention, Control, and Countermeasure (SPCC) Rules

F. ASTM A312/A312M-11 Pipe, Stainless Steel

G. ASTM A106/A106M-06 Pipe, seamless carbon steel

H. ASME B31.9, Building Services Piping.

I. NFPA 30. Flammable and Combustible Liquids Code.

J. NFPA 37 – Installation and Use of Stationary Combustible Engine and Gas Turbines.

K. NFPA 70 National Electrical Code.

L. UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids.

M. UL 508A - Standard for Industrial Control Panels

All work specified herein shall conform to or exceed the requirements of the above referenced codes, regulations and standards; provided, that whenever the provisions of said publications are in conflict with the requirements specified herein, the stringent requirement shall apply..

1.05 SUBMITTALS

A. Product Data:

1. Aboveground Piping;
   (a) Provide data on pipe materials, pipe fittings, valves, supports, thread sealant, and accessories.
   (b) Provide Welders Qualification Certificates.
2. Underground Piping;
   (a) Provide data on piping, fittings, transition sumps, and accessories.
   (b) Provide data on leak detection sensor.
   (c) Provide certification showing that underground piping system installer is factory trained and currently certified.
   (d) Provide manufacturers installation and testing instructions for underground fuel system.
   (e) Provide copy of completed warranty registration, after mailing original to manufacturer.

B. Provide a complete bill of material/ equipment list for all items supplied.

C. Equipment Data: Provide manufacturers information for all equipment.

D. Current license and certification for tank installer/remover.

1.06 OPERATION AND MAINTENANCE

A. Operation Data: Include installation instructions and exploded assembly views.

B. Maintenance Data: Include maintenance and inspection data, replacement part numbers and availability, and service depot location and telephone number.

C. Provide (4) copies of Operations and Maintenance manual. One copy shall be attached to tank in a clear PVC weather resistant document tube.

1.07 QUALITY ASSURANCE

A. Design, construction, installation, inspection, and testing shall be in compliance with the latest version of the NFPA-30 and all manufacturers' current installation instructions.

B. Comply with NFPA 70 "National Electric Code" for equipment, wiring, and conduit installed under this section.

C. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.

D. Welding Materials and Procedures: Conform to ASME B31.9 and applicable state regulations. Welders shall show evidence of qualification. Welders shall utilize a stamp to identify their work. Unqualified personnel will be rejected.

E. All equipment shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components or overall assembly.

F. Entire installation shall conform to requirements of local and state pollution control authorities.

G. Where specified codes or standards conflict, consult the Owner.

H. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a safe, complete and fully operational system which conforms to contract requirements and in which no item is subject to conditions beyond its design capabilities.

1.08 QUALIFICATIONS

A. CONTRACTOR: Company specializing in performing the work of this section with minimum five years documented experience.

B. Tank and piping installation contractor shall be certified as acceptable by local and state authorities

1.09 DELIVERY, STORAGE, AND HANDLING

A. Protection of Equipment:

1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Owner has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
2. Place damaged equipment in first class, new operating condition; or, replace same as determined and directed by the Owner. Such repair or replacement shall be at no additional cost to the Owner.
3. Protect new equipment and piping systems against entry of foreign matter on the inside. Clean both inside and outside before painting or placing equipment in operation.
4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Owner and shall be protected as required for new work.

B. Cleanliness of Equipment and Piping:

1. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
2. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
3. Piping systems shall be flushed, blown or pigged as necessary to provide clean systems.
4. Contractor shall be fully responsible for all costs, damages and delay arising from failure to provide clean systems and equipment.

1.010 PERMITS

A. Contractor shall obtain and complete all tank and fuel oil system permits and registration forms required by governmental authorities.

PART 2 - PRODUCTS

2.01 FUEL OIL AND VENT PIPING

A. Fuel oil piping system shall be stainless steel piping from the storage tank flanges to the HEMP protected gen-set flanges, and to the threaded couplings on the underground flexible piping in the transition sump; and from the threaded couplings on the other end of the flexible piping in the other transition sump to the day tank pumps connection points; and from the day tank to the site gen-set. There is a small amount of carbon steel piping trim at the day tank connecting the day tank components.

B. Piping shall comply with NFPA 30, “Flammable and Combustible Liquids Code” and ASME B31.9, "Building Services Piping," for fuel oil piping materials, installation, inspection, and testing.

C. Stainless steel piping shall conform to ASTM A312, Pipe, 304L, Stainless steel, Schedule 40S.

D. Carbon steel piping shall conform to ASTM A106 Grade B, seamless, Schedule 80. Black pipe only.

E. Carbon steel piping shall be painted white using Sherwin Williams DTM Bonding Primer (B66A50) and DTM Acrylic Coating (B66), or approved equal. Prep and application in strict accordance with manufacturer’s instructions.

F. Galvanized piping not permitted to be used as fuel or vent piping.

G. Joints shall be socket welded. Threaded joints not permitted except at valves, unions, equipment, and tank connections. See drawings for more details.

H. End connections for pipe or fittings shall be forged, socket weld type conforming to ASTM A 182 and ASME B16.11. Where threaded connections are indicated, provide connections that conform to ASME B16.3, Class 150 or ASME B16.11.

I. Flanges shall conform to ASME B16.5, 150#, RF. Provide 304L stainless socket weld flanges on fuel system piping. Provide 304L stainless steel threaded flanges for installation on owner-furnished HEMP Protected Gen-set. Provide carbon steel threaded flanges for installation on owner-furnished Site Gen-set.

J. Flange gaskets for stainless to stainless mating shall be Garlock Blue-Gard 3000 or approved equal. 1/16” thick. Aramid fiber with a Nitrile binder. Conform to ASME 16.21.

K. Insulating Flange Gasket Kit for final carbon steel to stainless steel mating shall be Advance Product & Systems, Inc. Product No. ETVG10DWG10MY (Full face gasket, Trojan Style, G10, Viton Seal, Double G10 Washers, Double Back Steel Washers, Mylar Sleeves). For testing of these flanges, use the Garlock Blue-Gard.

L. Valves;

1. Ball Valves:

   (a) Full port, brass body, hard chrome plated brass ball, Teflon seals blow out proof stems, lockable lever handle and balancing stops, threaded ends. UL listed. OPW 21BV, Morrison Bros. 691B, or approved equal.

   (b) Full port, Stainless Steel body and ball, PTFE seat blow out proof stems, lockable lever handle and balancing stops, threaded ends or socket-weld ends. Fire rated. Flow-Tek Triad series Model FP-3-1-05-3-J-G-L, FP-3-2-05-3-J-G-L, or approved equal.

2. Check Valves in the main fuel lines near branch tees: Bronze Body, brass seat ring, Viton Disc. UL listed. OPW 175B with internal pressure relief, or approved equal.

3. Check valve near day tank in fuel return line from gen-set; Stainless steel body and spring, PTFE Seat, 1", Titan Model CV 80-SS or approved equal.

4. Anti-Siphon Valve at Day Tank: Ductile Iron Body, Lockable Adjustable Mechanism. EBW (Franklin Fueling Systems) Model 606-300-01.

5. Supply Line Solenoid Valve (SV-001) near first sump: Stainless steel body, Viton seal, NEMA 4X, built-in expansion relief, normally closed, 120 volt. 1", Morrison Bros. Model 710-0100 1V.

M. Unions

1. Dielectric unions shall be Hart Industries D-3131-5-V-CS/304L (300 LB., FNPT x FNPT, 1", Viton O-ring, Carbon Steel Tailpiece with Bonded Coating, 404L Theadpiece).

2.02 UNDERGROUND DOUBLE CONTAINMENT PIPING SYSTEM

A. Design.

1. The contractor shall provide a secondarily contained flexible underground piping system that shall provide secondary containment for all primary piping, couplings, fittings and adapters. Piping runs shall be continuous between containment chambers (ie, tank & sumps or pans) in which all joints are contained within the containment chambers. The piping design shall allow for any leak in the primary supply or secondary containment piping to be directed to a leak detection sensor.

2. The Contractor shall provide the manufacturer a detailed pre-installation routing planning prior to manufacturer's design effort.

3. Underground double containment piping system shall be OPW Flexworks or approved equal. Entire system shall be by one manufacturer. The system shall be provided by contractor as a complete system; and shall be designed and fabricated by the containment system manufacturer with respect to the drawings, specifications, and the conditions of the site. The drawings indicate OPW Flexworks catalog numbers but only to the extent to give an overall description of the system. The complete design may require additional or different items.

B. Product And Chemical Compatibility

The flexible underground piping and associated couplings, fittings and adapters shall be chemically compatible with the products to be transported and with chemicals found naturally in the ground environment. The primary & secondary piping shall be compatible with gasoline, alcohols, gasoline-alcohol mixtures and all EPA approved additives, including MTBE.

C. Corrosion Resistance

The flexible underground piping and associated couplings, fittings and adapters which come in contact with the ground environment shall be made of non-metallic material or encapsulated by non-metallic components which prevent corrosion. The containment pipe and carrier pipe shall be flouropolymer based PVDF that meets the UL971 standard. Fittings shall be all stainless steel.

D. Structural Integrity

The flexible underground piping and associated couplings, fittings and adapters shall be designed and constructed of materials strong enough for its intended use. The flexible piping shall not collapse, crack or break due to ground movement or from backfill and high ground water pressures. Piping shall be able to transfer fluid up to a maximum temperature of 125 degrees F. Piping shall be operational with in a temperature band of minus 40C and +65C.

E. Bend Radius

1. The double wall flexible piping shall be capable of a minimum bend radius without kinking, cracking or breaking. The minimum bend radii shall be equal to or less than the following:
   (a) 0.75” - 18” radius
   (b) 1.0” - 18” radius
   (c) 1.5” - 24” radius
   (d) 2.0” - 36” radius
   (e) 3.0” - 48” radius

F. Fluid Flow Efficiency

Both the primary inner and secondary outer pipe shall have an interior surface which is a smooth (non-corrugated) profile and be made of a low friction resistant material for improved fluid flow efficiency.

G. Operating Pressures & Vacuums

The flexible underground piping shall have a minimum five to one (5:1) safety factor from maximum operating pressure for rated pressure. The maximum operating pressure rating for 1.5” diameter piping shall be 100 psi primary and 10 psi secondary. 3/4”, 1”, 2” and 3” piping shall be rated at a maximum operating pressure of 75 psi primary and 10 psi secondary. For suction systems the pipe shall be capable of withstanding 29” mercury vacuum.

H. Pipe Expansion

The primary supply pipe shall not expand more than .0025% in diameter and overall length when pressurized to 60 psi to permit accurate pressure decay readings by an in-line leak detector.

I. Interstitial Interconnection

All primary and secondary piping shall be connected in such a way as to permit integrity testing both during installation and at periodic intervals in the future. Both primary and secondary piping shall remain continuous during operation.

J. UL Testing

Both the primary and secondary piping and their associated fittings shall be independently tested in accordance with UL 971.

K. Transition Sump Assembly.

Transition sump assembly shall be one piece FRP sump with removable FRP top. Provide flexible entry boots for watertight pipe and conduit entries.

L. Access piping.

Access piping shall be a 4" diameter high density polyethylene corrugated flexible piping that provides additional protection to the double-wall flexible piping; and allows removal and replacement without excavation.

M. Leak Detection Sensors.

1. Furnish and install leak detection sensors in each transition sump assembly. Leak sensors shall be diesel fuel/water discriminating type and shall have a wiring fault detection feature.
2. Leak sensor shall be compatible with the Incon TS-550 and shall be equal to the Incon Sump Sensor Model No. TSP-DDS w/mounting kit TSP-KS. Sensors shall quickly and accurately detect the presence and amount of water and/or fuel in the containment sump or dispenser pan. Sensor shall use proven magnetostrictive technology to detect the presence of hydrocarbons and water, the station (where allowed) remains in operation when water alone is detected. Sensor shall be able to generate three different alarms for the detection of hydrocarbons, for liquid in sump and when the sump is full.
3. All electronic systems must be capable of operating in an area with high RFI (Radio Frequency Interference). Systems shall be utilized at sites where the field space intensity may exceed 10 volts per meter.
4. Sensors shall be reusable after an alarm condition is sensed. Submit shop drawings for the tank management and leak detection system that include the following:
   (a) Wiring schematics for all parts of the system showing each operating device and listing their normal ranges of operating values (including pressures, temperatures, voltages, currents, speeds, etc.).
   (b) Single line diagrams of the entire system.
   (c) Diagrams for posting that include distance markings such that alarm indications can be correlated to leak location in plan view. The diagrams shall include a piping and wiring display map with schematic diagrams from the leak detection system manufacturer. The diagrams shall be framed under glass or laminated plastic and be posted where indicated by the Owner.

N. Leak Detection System Test

Activate and test the entire leak detection system in accordance with manufacturer's testing procedures. Use the electronic monitoring/alarm panel to record and present the results.

O. Storage and Handling

Storage and handling in strict accordance with manufacturer's instructions.

P. Installation

1. Underground double containment system shall be installed by a factory trained and currently certified installer in order to maintain valid product warranty. Contractor shall complete warranty registration and mail to manufacturer for warranty activation, with copy given to Owner.
2. Installation of underground double containment system shall be in accordance with manufacturer's instructions. Contractor shall follow the manufacturer's burial requirements such as proper pipe trenching, bedding & backfill material, and burial depth.
3. Install appropriate magnetically detectable marker tape in all piping trenches as per manufacturer's instructions. All underground piping shall be marked with a continuous marker tape.
4. Installer shall make proper sealed connections to the transition sumps for piping and conduits with manufacturer's components.

Q. Testing

Perform testing in compliance with the manufacturer's published testing instructions. Perform pre-backfill and post-backfill pressure testing of primary and secondary pipe as required**.**

2.03 SUMP IN GEN-SET ROOM

A. Furnish and install floor leak detection sensor inside the existing sump in existing gen-set building. Leak sensor shall be compatible with the Incon TS-550 and shall be equal to the Incon Sump Sensor Model No. TSP-DDS w/mounting kit TSP-KS.

2.04 DAY TANK PACKAGED UNIT

A. Furnish and install a 150 gallon double wall UL listed day tank packaged unit in accordance with Section 23 10 30, DAY TANK PACKAGED UNIT, and as described herein.

PART 3 - EXECUTION

3.01 CONSTRUCTION REQUIREMENTS.

A. Installation of new fuel oil storage system and removal from service of existing underground storage tank shall be performed by a qualified state licensed and certified tank installation and removal Contractor. The Contractor's on-site representative shall hold a valid worker's certification for tank removals and installations. The Contractor shall comply with the requirements of all laws, ordinances, rules and regulations of federal, state and local authorities regarding the removal, disposal, handling, storing, transporting and installation of fuel storage tanks, associated equipment and fuel oil stored materials. The Contractor shall provide documentation, which is acceptable to the Owner, that their firm is experienced and qualified in above-ground and under-ground fuel storage tank system removal and installations with at least two (2) years experience. All personnel shall be trained and experienced in above ground and underground storage tank system removal and installation practices and safety precautions.

3.02 NEW FUEL OIL STORAGE TANK

A. The contractor shall install the new fuel oil storage tank system on new concrete foundation as shown on drawings. Tank shall be installed in accordance with Tank Supplier's Instructions.

B. Contractor shall be responsible for protection, proper offloading and placement of all storage tank and associated equipment.

C. Tank shall be installed in strict accordance with the most recent installation instructions provided by the tank manufacturer, UFC, NFPA, local ordinance, recognized engineering procedure, and other applicable codes.

D. Conform to NFPA 30 or 31 as applicable.

E. Support tanks on steel saddles welded to the tanks. Anchor to concrete foundations.

F. Provide electrical grounding in accordance with NFPA 70.

G. In performing work under this contract, the Contractor shall ensure that proper coordination exists with the Department's facilities, cities, counties, state and local law enforcement, utilities, fire departments and other state and federal agencies, etc.

H. Install all permanent piping and fittings using compatible, non-hardening thread sealant material. Compatible thread sealant material shall be tested and approved by manufacturer for use with off-road #2 Diesel Fuel with Red Dye, such as Rectorseal No. 7.

I. Level tanks as necessary with non-metallic, non-shrink grout and steel shims. Grouting shall be continuous and chamfered at 45 degrees.

J. Install ladder, platform, and handrails as required.

3.03 FUEL OIL STORAGE TANK SPECIALTIES

A. Receive and Install all specialties as per storage tank system supplier's instructions. Including;

1. Tank normal vent 3" riser pipe spool piece. Cover opening with proper secure cap.
2. Tank level mag-probe 4" riser mounting spool piece. Cover opening with proper secure cap.Install all specialties as per storage tank system supplier's instructions.

3.04 ABOVEGROUND PIPING

A. Thoroughly clean pipe of all scale and foreign matter before the piping is assembled. Cut pipe accurately to measurements established at the jobsite, and worked into place without springing or forcing. Cut pipe square and have burrs removed by reaming. Install pipe to permit free expansion and contraction without causing damage to the building structure, pipe, joints, or supports. Install equipment and piping into space allotted and allow adequate acceptable clearances for installation, replacement, entry, servicing, and maintenance. Provide electric isolation fittings between dissimilar metals. Install piping straight and true to bear evenly on supports. Piping shall be free of traps, shall not be embedded in concrete pavement, and shall drain as indicated. Make changes in direction with fittings.

B. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction. All installation shall be in accordance with manufacturer's published recommendations.

3.05 ABOVEGROUND PIPING INSTALLATION:

A. Joints: Socket or butt-welded. Threaded joints not permitted except at valves, unions, equipment, and tank connections.

B. Route piping in orderly manner and maintain gradient. Do not cut, weaken or modify any existing utility or structural member without written approval of the Engineer.

C. Install piping to conserve building/site space and not to interfere with use of space. Provide clearance for access to valves and fittings.

D. Piping shall be supported, evenly and adequately, as necessary to maintain line and grade, with due provisions for expansion and contraction without stressing pipe, joints, or connected equipment. Use Unistrut metal framing members and appurtenances for pipe supports or approved equal. All such members and appurtenances shall be hot-dipped galvanized (ASTM 123 or 153) or Electro-galvanized zinc plate (ASTM B633). Piping will not be allowed to be directly supported on concrete.

E. Provide insulating unions or flange gasket assemblies for joints between dissimilar metal pipe and equipment, unless directed otherwise.

F. Use compatible sealant when assembling all threaded connections. Compatible thread sealant material shall be tested and approved by manufacturer for use with off-road #2 Diesel Fuel with Red Dye, such as Rectorseal No. 7.

G. Prepare carbon steel pipe, fittings, supports and accessories not prefinished, ready for finish painting. Paint piping with a primer and corrosive resistant urethane or acrylic coating similar to Sherwin Williams DTM Bonding Primer B66A50 and DTM Acrylic Coating (B66). Follow manufacturer application instructions. Do not paint stainless steel piping.

H. Identify piping systems. Provide labels with direction arrows and either “FUEL OIL SUPPLY” or “FUEL OIL RETURN”.

I. Install valves with stems upright or horizontal, not inverted.

J. Install solenoid valve (SV-001) near the transition sump after the tee to the HEMP Module as shown on the drawing. Interlock SV-001 with operation of day tank supply pump. SV-001 provides anti-siphon protection for the line to day tank.

K. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

L. Make fuel piping connections to HEMP Protected Module in accordance with industry standards and local codes using flanges as shown on drawings.

M. Make fuel piping connections to existing gen-set in accordance with manufacturer’s instructions. Coordinate fuel line tie-ins and housing penetrations with selected gen-set supplier.

3.06 TESTING OF PIPING, EXTERNAL OF TANK

A. Inspect and test fuel oil piping according to NFPA 30, "Testing" Paragraph; and according to requirements of authorities having jurisdiction.

B. All fuel piping shall be tested before being placed in service. Air testing of all system piping, separate from tank and generator, shall be done with compressed air at 50 psig, for at least two (2) hours, and shall be witnessed by an Owner’s representative.

C. Follow procedures and checklists included in Appendix B of this specification.

D. Repair all leaks and retest until proven airtight. Flush system thoroughly with diesel fuel until all moisture or debris is removed and diesel is clear. Fill system with clean diesel fuel, close end valves and allow system to remain full. Visually check for leaks during initial run test. Legally dispose of flush diesel.

3.07 DAY TANK PACKAGE INSTALLATION

A. The day tank package shall be installed outside adjacent to the existing generator. Install as per manufacturer’s instructions, local and state codes and regulations, and as shown on the plan drawings on a concrete pad.

B. Provide 1” Schedule 40S, 304L stainless piping to day tank. Make all connections with dielectric pipe unions to facilitate service/removal:

1. Supply to day tank inlet pump.
2. Return to main storage tank from reversing pump.
3. Supply to and return from generator.

C. Dielectric unions shall be Hart Industries D-3131-5-V-CS/304L (300 LB., FNPT x FNPT, 1”, Viton O-ring, Carbon Steel Tailpiece with Bonded Coating, 404L Theadpiece). Install union so that the stainless threadpiece side is towards the stainless steel fuel system piping.

D. Install all required vent caps (normal and emergency) and terminate Vent piping per federal, state, and local codes. Terminate normal vent piping at elevation required by local code. Vent piping to be properly supported to building. Install priming tee and wye-strainer in suction line leading to intake of day tank supply pump. Furnish and install all additional piping trim required for a complete installation of the day tank.

E. Furnish and install an Anti-Siphon Valve (ASV) in the suction line from the day tank to the gen-set on the top of the day tank. ASV to be an EBW (Franklin Fueling Systems) Model 606-300-01, 1", Ductile Iron Body, with Lockable Adjustable Mechanism. Contactor shall field-determine the elevation difference between the top of the daytank and the lowest point in the fuel piping to the gen-set. That elevation difference will serve as the set-point for the ASV. Contractor shall set valve in accordance with manufacturer's instructions.

F. Furnish and install a check valve near the daytank in the fuel return line from the gen-set. Check valve to be 1", Titan Model CV 80-SS, or approved equal.

G. Furnish and install interlock from Day Tank Control Panel to Solenoid Valve (SV-001). Solenoid valve is to open when Supply Pump is on and is to close when Supply Pump is off.

3.08 EXISTING FUEL STORAGE TANK AND PIPING

A. Contractor shall permanently close in-place existing underground storage tank (UST) by the filling method and shall remove associated piping in strict accordance with all laws and regulations of the State of Georgia and County of Hall.

B. Contractor shall perform all steps required in strict accordance with the latest version of the UST Closure Guidance Document published by the Georgia Department of Natural Resources (Environmental Protection Division).

C. Contractor shall fill empty tank with an approved inert material, and close product piping by emptying and removing piping and capping ends.

D. Contractor removing UST must be licensed by the Georgia Contractors State License Board and possess the Hazardous Substance Removal Certification.

E. Contractor shall apply for all required permits and hire the services of a Professional Engineer of Professional Geologist registered in the State of Georgia to prepare the required closure report.

F. Contractor shall be responsible for all costs and duties, including sampling and analysis, required in report and by permit.

G. Contractor shall empty storage tank and isolate from system. Contractor shall deliver removed fuel to a licensed recycle facility.

H. Remove and discard existing fuel piping (aboveground and underground) from gen-set to storage tank. Fill and backfill to match surrounding conditions.

3.09 SIGNAGE

A. Signage: Furnish and install one (1) professionally painted sign permanently affixed adjacent to tank facility. See drawing S-502 for signage requirements.

3.010 DEMONSTRATION AND TESTING

A. After installation, Contractor shall perform complete testing of all systems as per manufacturer's specifications, start-up criteria, and state requirements. Contractor shall provide verification of proper tightness testing, performed after installation, of primary tank, secondary containment system, and piping in writing to Owner.

B. Train Owner's maintenance personnel on procedures and schedules related to start-up and shutdown, troubleshooting, servicing, and preventive maintenance.

END OF SECTION 23 10 20

Appendix A
Diesel Fuel for Gainesville, GA

Diesel Fuel Oils shall meet ASTM D975, "Standard Specification for Diesel Fuel Oils".

Fuel:
Fuel shall be Grade No.2-D S15, or a winterized blend of Grade No.2-D S15 and Grade No.1-D S15.

Additives:
- Fuel stabilizer and biocide additives shall be properly selected and blended into the fuel to improve the suitability of the fuel for long term storage (longer than 12 months) by preventing fuel deterioration and microbiological growth.
- A fuel system icing inhibitor shall be properly selected and blended into the fuel to purge small quantities of water from the fuel and prevent the formation of ice crystals.
- If necessary or if recommended by best practices, supplier may use additives to improve lubricity, improve cold flow, cetane number, and to improve cold temperature operability.

Additive concentration limits shall be as per product manufacturer's instructions and industry standards.

- Provide a winter blend with additives to enable operation of the diesel engine at an expected ambient temperature of 20°F; (ASTM D975, Table X5.1, Tenth Percentile Minimum Ambient Air Temperatures).
- Viscosity requirements are based on the needed suction lift to the gen-sets subbase tank pumps.

Minimum viscosity @ 104 °F:	32 SSU or 1.7 Centistokes
Maximum viscosity @ 20°F:	167 SSU or 40 Centistokes
Maximum Cloud Point:	20 °F
Maximum Cold Filter Plugging Point:	11 °F
Minimum Cetane Number:	45
Lubricity:	520 HFRR @ 140 °F, micron, max

-Fuel supplier shall provide a fuel that meets these requirements. This may be accomplished using a winter blend and/or fuel additives.
-The preference is that the No.1-D diesel fuel portion not exceed 30%; however, if necessary, this portion may be increased to 40%.

Fuel supplier shall hire an accredited independent lab to sample and test the fuel after the fuel has been delivered, in order to provide proof that the requirements have been met. (It may be advantageous to the fuel supplier to also sample and test the fuel after the blend is formulated but prior to filling the storage tank.)

Test Methods (ASTM Standards):

Viscosity (D 445), Cloud Point (D 2500), Cold Filter Plugging Point (D 6371), Cetane Number (D 613), Lubricity (D 6079)

APPENDIX B

Installation Verification and Testing of

Field Installed Diesel Fuel Oil Piping

Job Information	
Job Name:_____	Installing Organization:_____
Address:_____	Address:_____
City:_____	City:_____
State:_____ Zip:_____	State:_____ Zip:_____

General Notes

1. All personnel must be trained in the use of and wear required personal protective equipment (PPE).
2. All personnel must be properly trained on the use of all equipment that will be used to perform tests.
3. The test procedures contained herein conforms to NFPA 30 and ASME B31.9.
4. Testing shall be jointly documented by the installer and KBR's QC representative.
5. Regulator should always be adjusted "up" to the desired pressure to ensure accuracy.
6. Leaks may be detected by use of soap bubble or other means listed in ASME B31.9.
7. If leaks are detected at any stage of pressurization, the air supply shall be removed and remaining pressure bled off by slowly opening the ball valve (#17).
8. Do not reuse test gaskets for permanent installation.
9. All diesel fuel used in testing shall be collected and disposed of in accordance with local, state and federal regulations
10. Record all failures (leaks) and any associated repairs made on the Record of Failures / Repairs sheet.
11. Before performing these tests, the underground piping must have passed all of its required tests in accordance with the specifications and the manufacturer's instructions. After passing those separate independent tests, the underground piping shall then be connected to the aboveground piping system to be tested as part of these tests.

Test Apparatus General Notes

1. All welded joints per ASME by a qualified person.
2. Threaded connections must use Teflon tape to prevent leaking. Tape should start just after the end thread to prevent tape from interfering with proper operation.
3. Additional items listed in the Bill of Materials (BOM) may be used to adjust assembly for field conditions; however, the general order of the schematic shall be maintained.
4. Test apparatus can be rotated as required as field conditions dictate; however, pressure relief valve (#13) shall be oriented in the vertical position for proper operation.
5. Test apparatus must be tested prior to first use. It will only need to be tested one time. Subsequent uses will not require retesting of the apparatus. See Pre-Test, Test Apparatus – Prior to First Use.
6. After testing and flushing test apparatus, when test apparatus is not in use, cap ends to prevent contamination.

APPENDIX B

Installation Verification and Testing of

Field Installed Diesel Fuel Oil Piping

Pre-Test

Test Apparatus – Prior to First Use	Installer	QC Rep
1. Review General Notes and Test Apparatus General Notes. Refer to General Notes 6, 7, and 10 in regard to locating and repairing leaks.		
2. Clear area of all unnecessary personnel.		
3. Check test apparatus for proper assembly per test apparatus schematic. Verify pressure gauge (#16) calibration certificate is current and gauge face provides reading to at least 1 PSI increments.		
4. Install pipe cap (#19) with Teflon tape on flexible hose (#6).		
5. Close ball valve (#17) and adjust regulator (#16) up to 10 PSIG.		
6. Attach air hose from charged portable air tank or compressor. If air compressor is used, ensure rated SCFM of air compressor does not exceed safety relief valve (#13) rating.		
7. Open air valve on portable air tank. If air compressor is used, power on compressor.		
8. Slowly open ball valve (#17) and verify pressure gauge-APP (#14) reads 10 PSIG. Close ball valve (#17) and verify pressure gauge-APP (#14) reads 10 PSIG. If gauge-APP does not indicate 10 PSIG, locate and repair leak(s) and restart procedure at Step 5.		
9. Adjust regulator (#16) up to 25 PSIG and slowly open ball valve (#17). Verify pressure gauge- APP (#14) reads 25 PSIG. Close ball valve (#17) and after 5 Minutes verify pressure gauge-APP (#14) reads 25 PSIG. If gauge-APP does not indicate 25 PSIG, locate and repair leak(s) and restart procedure at Step 5.		
10. Adjust regulator (#16) up to 40 PSIG and slowly open ball valve (#17). Verify pressure gauge-APP (#14) reads 40 PSIG. Close ball valve (#17) and after 5 Minutes verify pressure gauge-APP (#14) reads 40 PSIG. If gauge-APP does not indicate 40 PSIG, locate and repair leak(s) and restart procedure at Step 5.		
11. Adjust regulator (#16) up to 55 PSIG and slowly open ball valve (#17). Verify pressure gauge-APP (#14) reads 55 PSIG. Close ball valve (#17) and after 5 Minutes verify pressure gauge-APP (#14) reads 55 PSIG. If gauge-APP does not indicate 55 PSIG, locate and repair leak(s) and restart procedure at Step 5.		
12. Remove air supply and slowly open ball valve (#17) to bleed of air pressure in test apparatus piping. Reconnect air supply.		
13. Adjust regulator (#16) to 50 PSIG and slowly open ball valve (#17). Verify pressure gauge-APP (#14) reads 50 PSIG. Close ball valve (#17), remove air supply, and after 1 hour verify pressure gauge-APP (#14) reads 50 PSIG. If gauge-APP does not indicate 50 PSIG, locate and repair leaks and restart procedure at Step 5.		
14. Slowly open ball valve (#17) to bleed off pressure.		
15. Remove pipe cap (#19). Flush test apparatus assembly with fresh diesel fuel to clear any debris and moisture. Collect used diesel fuel.		

Signature and Date

Installer _____ Date _____

Quality Control Representative _____ Date _____

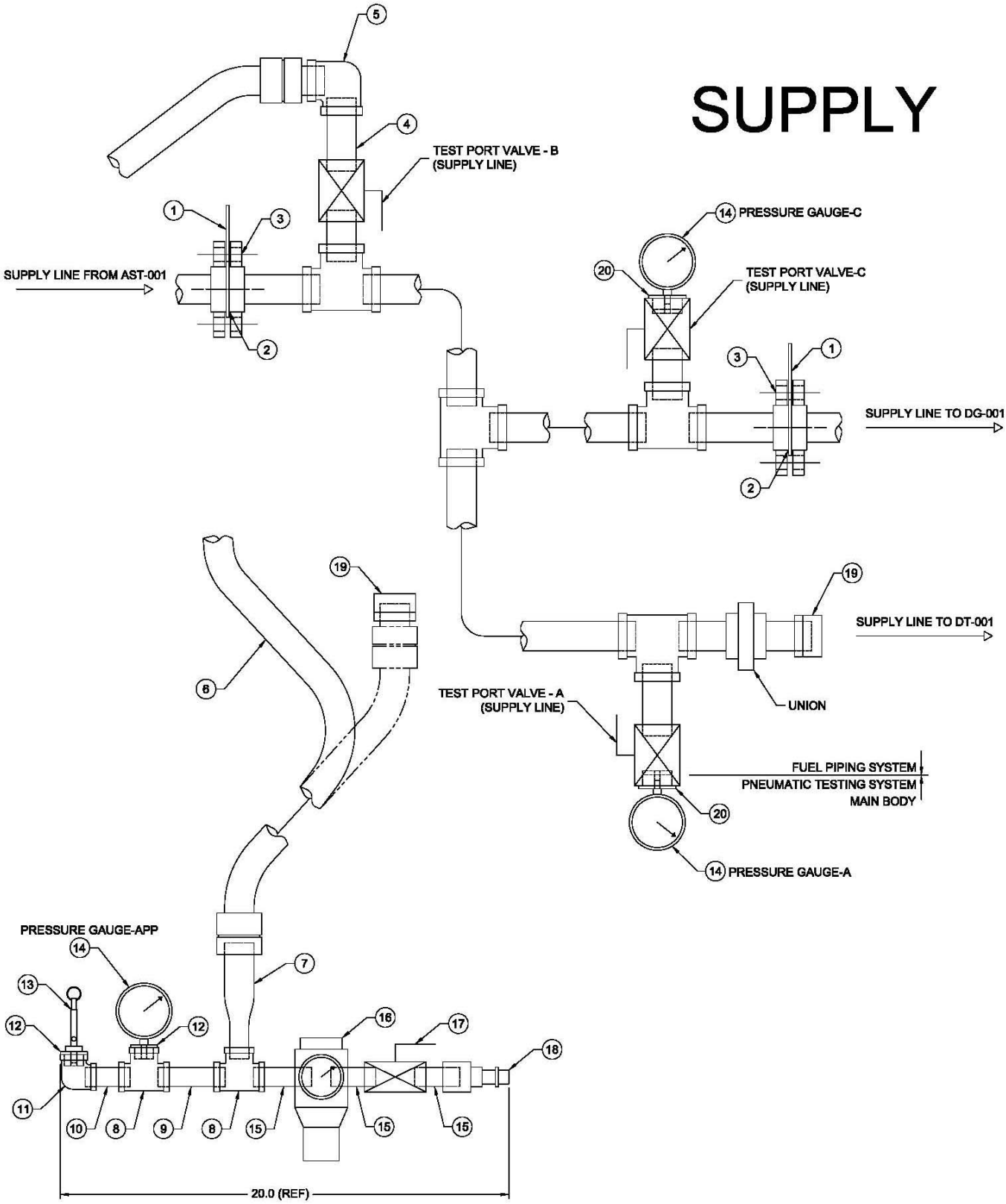
Test # 1

Fuel Supply – Fuel Storage Tank to Generators	Installer	QC Rep
1. Review General Notes. Refer to General Notes 6, 7, and 10 in regard to locating and repairing leaks.		
2. Clear area of all unnecessary personnel.		
3. Check installed piping and verify installation is per drawings and specifications.		
4. If installed, unbolt the end flanges of the fuel system piping line to be tested.		
5. Install paddle blind (#1) with gasket (#2) with stud bolts (#3) on the fuel supply line at Aboveground Storage Tank (AST-001), and HEMP Module Gen-set (DG-001). Break union at Day Tank (DT-001) and unscrew 1" pipe stub-out on DT-001. Install cap (#19) on the end of the pipe stub-out and re-tighten the union.		
6. Install the test apparatus to test port valve-B on the fuel supply line at AST-001 by installing pipe nipple (#4) and elbow (#5) with Teflon tape to the test port valve. Connect the test apparatus flexible hose (#6) to the open end of elbow (#5). Open test port valve-B.		
7. Install test pressure gauge-A (#14) with threaded reducing bushing (#20) in test port valve-A on the fuel supply line at DT-001. Install test pressure gauge-C (#14) with threaded reducing bushing (#20) in test port valve-C on the fuel supply line at DG-001. Open test port valve-A and test port valve-C.		
8. Close ball valve (#17) and adjust regulator (#16) up to 10 PSIG.		
9. Attach air hose from charged portable air tank or compressor. If air compressor is used, ensure rated SCFM of air compressor does not exceed safety relief valve (#13) rating.		
10. Open air valve on portable air tank. If air compressor is used, power on compressor.		
11. Slowly open ball valve (#17) and verify pressure gauge-APP (#14) reads 10 PSIG. Close ball valve (#17) and verify pressure gauge-APP (#14) reads 10 PSIG. If gauge-APP does not indicate 10 PSIG, locate and repair leak(s) and restart procedure at Step 8.		
12. Check test pressure gauges-A & C. Both gauges- A & C should read 10 psig. If gauge- A or C read 0 PSIG, one or more of the check valves in that line may be installed backwards; inspect check valves; reinstall or replace and restart procedure at Step 8.		
13. Adjust regulator (#16) up to 25 PSIG and slowly open ball valve (#17). Verify pressure gauges-A, C, and APP (#14) all read 25 PSIG. Close ball valve (#17) and after 5 Minutes verify pressure gauges- A, C, and APP (#14) all read 25 PSIG. If any of the gauges do not indicate 25 PSIG, locate and repair leak(s) and restart procedure at Step 8.		
14. Adjust regulator (#16) up to 40 PSIG and slowly open ball valve (#17). Verify pressure gauges- A, C, and APP (#14) all read 40 PSIG. Close ball valve (#17) and after 5 Minutes verify pressure gauges- A, C, and APP (#14) all read 40 PSIG. If any of the gauges do not indicate 40 PSIG, locate and repair leak(s) and restart procedure at Step 8.		
15. Adjust regulator (#16) up to 55 PSIG and slowly open ball valve (#17). Verify pressure gauges- A, C, and APP (#14) all read 55 PSIG. Close ball valve (#17) and after 5 Minutes verify pressure gauges- A, C, and APP (#14) all read 55 PSIG. If any of the gauges do not indicate 55 PSIG, locate and repair leak(s) and restart procedure at Step 8.		
16. Remove air supply and slowly open ball valve (#17) to bleed off air pressure in test apparatus piping. Close ball valve (#17). Reconnect air supply.		
17. Adjust regulator (#16) to 50 PSIG and slowly open ball valve (#17). Verify pressure gauges- A, C, and APP (#14) all read 50 PSIG. Close ball valve (#17), remove air supply, and after 2 hours verify pressure gauges- A, C, D, and APP (#14) all read 50 PSIG. If any of the gauges do not indicate 50 PSIG, locate and repair leaks and restart procedure at Step 8.		
18. Slowly open ball valve (#17) to bleed off pressure. Disconnect the test apparatus.		
19. Flush line with fresh diesel fuel until diesel fuel runs clear of debris or moisture. Collect used diesel fuel.		
20. Close all test port valves. Re-install all plugs.		
21. Remove paddle blinds (#1) and gaskets (#2) and cap (#19). Install new gaskets and bolt-up flanges. Break the union and reinstall the pipe stub-out to DT-001 and re-tighten the union.		

Signature and Date

Installer _____ Date _____

Quality Control Representative _____ Date _____


SUPPLY
TEST PORT VALVE - B
(SUPPLY LINE)
SUPPLY LINE FROM AST-001
PRESSURE GAUGE-C
TEST PORT VALVE-C
(SUPPLY LINE)
SUPPLY LINE TO DG-001
SUPPLY LINE TO DT-001
UNION
TEST PORT VALVE - A
(SUPPLY LINE)
FUEL PIPING SYSTEM
PNEUMATIC TESTING SYSTEM
MAIN BODY
PRESSURE GAUGE-A
PRESSURE GAUGE-APP
20.0 (REF)

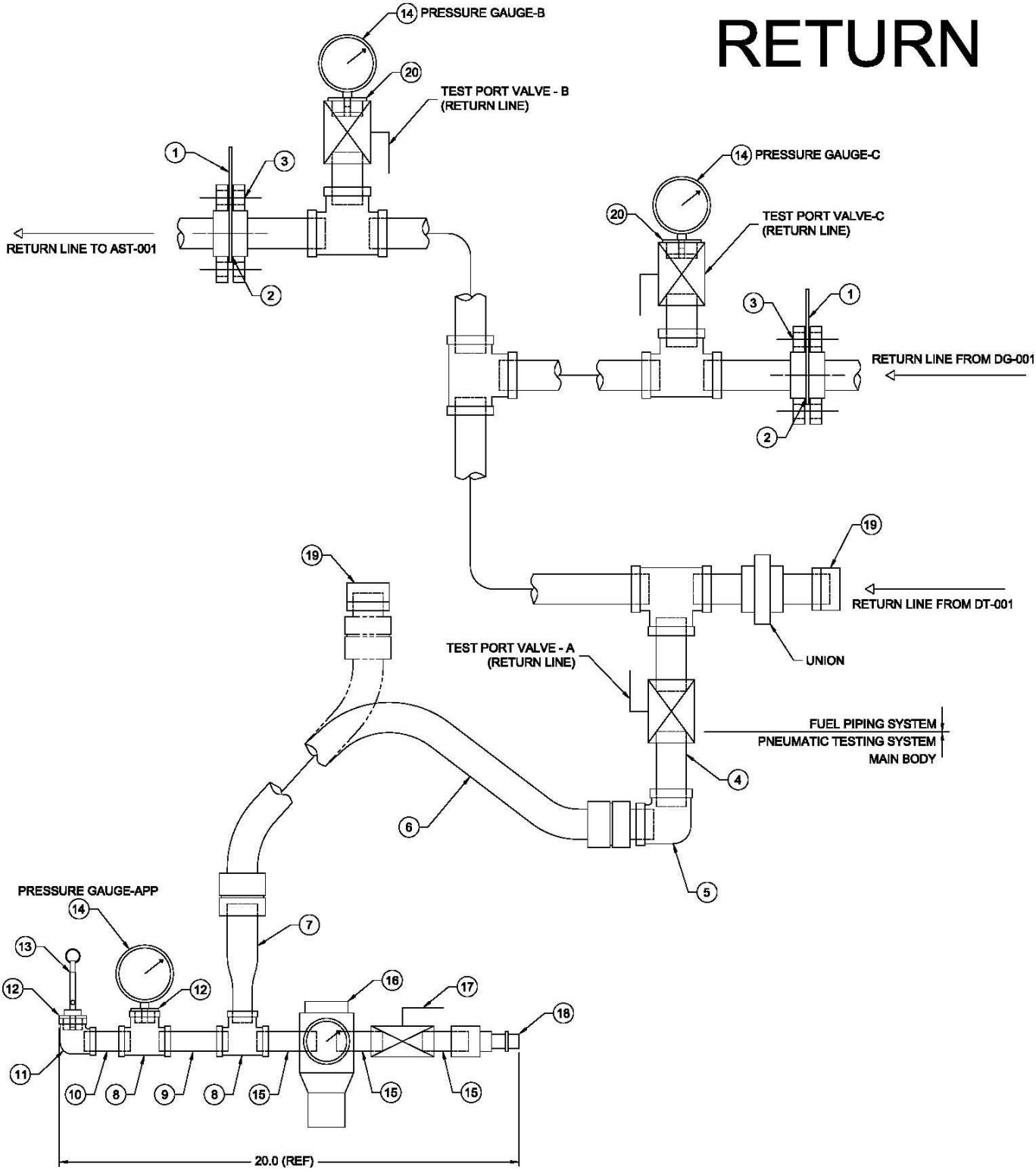
Test # 2

Fuel Return – Generators to Fuel Storage Tank	Installer	QC Rep
1. Review General Notes. Refer to General Notes 6, 7, and 10 in regard to locating and repairing leaks.		
2. Clear area of all unnecessary personnel.		
3. Check installed piping and verify installation is per drawings and specifications.		
4. If installed, unbolt the end flanges of the fuel system piping line to be tested.		
5. Install paddle blind (#1) with gasket (#2) with stud bolts (#3) on the fuel return line at Fuel Tank (AST-001) and HEMP Module Gen-set (DG-001). Break union at Day Tank (DT-001) and unscrew 1" pipe stub-out on DT-001. Install cap (#19) on the end of the pipe stub-out and re-tighten the union.		
6. Install the test apparatus to test port valve-A on the fuel return line at DT-001 by installing pipe nipple (#4) and elbow (#5) with Teflon tape to the test port valve. Connect the test apparatus flexible hose (#6) to the open end of elbow (#5). Open test port valve-A.		
7. Install test pressure gauges-C&D (#14) with threaded reducing bushing (#20) in test port valve-C on the fuel return line at DG-001. Install test pressure gauge-B (#14) with threaded reducing bushing (#20) in test port valve-B on the fuel return line at AST-001. Open test port valve-B and test port valve-C.		
8. Close ball valve (#17) and adjust regulator (#16) up to 10 PSIG.		
9. Attach air hose from charged portable air tank or compressor. If air compressor is used, ensure rated SCFM of air compressor does not exceed safety relief valve (#13) rating.		
10. Open air valve on portable air tank. If air compressor is used, power on compressor.		
11. Slowly open ball valve (#17) and verify pressure gauge-APP (#14) reads 10 PSIG. Close ball valve (#17) and verify pressure gauge- APP (#14) reads 10 PSIG. If gauge-APP does not indicate 10 PSIG, locate and repair leak(s) and restart procedure at Step 8.		
12. Check test pressure gauges-B, and C. Gauge-B should read 10 psig and gauge- C should read 0 psig. If gauges-B, and C do not read correctly, the check valves in that line may be failing or installed backwards; inspect check valves; reinstall or replace and restart procedure at Step 8.		
13. Adjust regulator (#16) up to 25 PSIG and slowly open ball valve (#17). Verify pressure gauge-APP (#14) reads 25 PSIG. Also verify pressure gauge-B reads 25 psig and pressure gauge-C begins to indicate a pressure when ball valve (#17) is near or at full open. Close ball valve (#17) and after 5 Minutes verify pressure gauges APP & B (#14) read 25 PSIG. If not, locate and repair leak(s) and restart procedure at Step 8.		
14. Adjust regulator (#16) up to 40 PSIG and slowly open ball valve (#17). Verify pressure gauges-APP & B (#14) read 40 PSIG; pressure gauge-C should read approx. 15 psig. Close ball valve (#17) and after 5 Minutes verify pressure gauges-APP & B (#14) read 40 PSIG. If not, locate and repair leak(s) and restart procedure at Step 8.		
15. Adjust regulator (#16) up to 55 PSIG and slowly open ball valve (#17). Verify pressure gauges-APP & B (#14) read 55 PSIG; pressure gauge-C should read approx. 30 psig. Close ball valve (#17) and after 5 Minutes verify pressure gauges-APP & B (#14) read 55 PSIG. If not, locate and repair leak(s) and restart procedure at Step 8.		
16. Remove air supply and slowly open ball valve (#17) to bleed off air pressure in test apparatus piping. Close ball valve (#17). Reconnect air supply.		
17. Adjust regulator (#16) to 50 PSIG and slowly open ball valve (#17). Verify pressure gauge-APP & B read 50 PSIG. Close ball valve (#17), remove air supply.		
18. Relocate test apparatus to test port valve-C in order to pressurize the upstream side of the check valves up to 50 PSIG. Relocate pressure gauge C to test port valve-A. Verify pressure gauges-APP, B, & C all read 50 PSIG. Close ball valve (#17), remove air supply, and after 2 hours verify pressure gauges-APP, B, and C (#14) all read 50 PSIG. If any of the gauges do not indicate 50 PSIG, locate and repair leaks and restart procedure at Step 8.		
19. Slowly open ball valve (#17) to bleed off pressure. Disconnect the test apparatus.		
20. Flush line with fresh diesel fuel until diesel fuel runs clear of debris or moisture. Collect used diesel fuel.		
21. Close all test port valves. Re-install all plugs.		
22. Remove paddle blinds (#1) and gaskets (#2) and cap (#19). Install new gaskets and bolt-up flanges. Break the union and reinstall the pipe stub-out to DT-001 and re-tighten the union.		

Signature and Date

Installer Date

Quality Control Representative Date


RETURN
14 PRESSURE GAUGE-B
20
TEST PORT VALVE - B
(RETURN LINE)
1
3
2
RETURN LINE TO AST-001
14 PRESSURE GAUGE-C
20
TEST PORT VALVE-C
(RETURN LINE)
3
1
2
RETURN LINE FROM DG-001
19
RETURN LINE FROM DT-001
UNION
19
TEST PORT VALVE - A
(RETURN LINE)
FUEL PIPING SYSTEM
PNEUMATIC TESTING SYSTEM
MAIN BODY
4
6
5
PRESSURE GAUGE-APP
14
7
13
12
12
16
17
18
11
10
8
9
8
15
15
15
20.0 (REF)

Record of Failures / Repairs

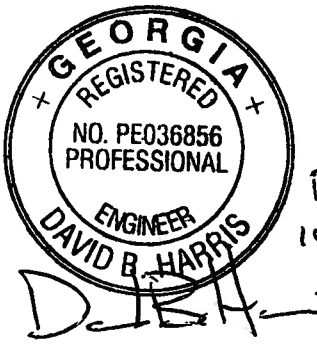
	Line Description	Failure Description	Repair Description	Installer	QC Rep
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					

TEST APPARATUS BOM

ITEM #	DESCRIPTION	QTY
1	1"-150LB PADDLE BLD, API 590, ASTM A240 TYPE 304, MILLED TO 1/8" THICK WITH SMOOTH FINISH	4
2	1"-FLAT GASKET, 150LB, ASME B16.21, GARLOCK BLUE-GARD 3000	4
3	1/2"-(4) STUD-BOLT, A193 GR B7, W/A194 GR. 2H NUTS	3
4	1" X 3"-PIPE NIPPLE, WELDED E=0.8, ASME B36.19, B36.10, ASTM A312 GR TP304L, TBE, SCH 40S	1
5	1"-ELL, 90-DEG, ASME B16.11, ASTM A182 GR F304L, SCRD, 150LB	1
6	1" X 8' LONG, PLIOVIC PLVS 250 HOSE, WITH MALE PIPE SWIVEL / FEMALE PIPE SWIVEL	1
7	1" THD X 1/2" PLAIN - SWAGED NIPPLE, CONC., MSS SP-95, A403 GR WP 304L, SCH 40S	1
8	1/2"-TEE, ASME B16.11, ASTM A182 GR F304L, SW, 3000#	2
9	1/2" X 3"-PIPE NIPPLE, WELDED E=0.8, ASME B36.19, B36.10, ASTM A312 GR TP304L, PBE, SCH 40S	1
10	1/2" X 2"-PIPE NIPPLE, WELDED E=0.8, ASME B36.19, B36.10, ASTM A312 GR TP304L, PBE, SCH 40S	1
11	1/2"-ELL, 90-DEG, ASME B16.11, ASTM A182 GR F304L, SW, 3000#	1
12	1/2" X 1/4"-150LB SW REDUCING INSERT, SW X THD, 304L SS	2
13	VALVE, SAFETY RELIEF, ASME SECTION VIII, 1/4" NPT, KUNKLE MODEL 0541-A01-KS-0060 (OR EQUIVALENT)	1
14	GAUGE, PRESSURE, 0-100 PSI, 2 1/2" DIAL FACE, 1/4" MNPT, SWAGELOCK PGI-63B-PG100-LAOX-J (OR EQUIVALENT)	4
15	1/2" X 2"-PIPE NIPPLE, SCH 40S, 304SS, TOE / POE	3
16	REGULATOR, 1/2" NPT PORT, PARKER P32*R64BNGP (OR EQUIVALENT)	1
17	1/2"-BALL 150LB SW, 316 SS BODY W/316 SS TRIM, ANSI/FCI 70-2 CLASS VI	1
18	3/8"-QUICK COUPLING, INDUSTRIAL INTERCHANGE, 1/2" FEMALE NPT, PARKER H3E-F (OR EQUIVALENT)	1
19	1" - CAP, ASME B16.11, ASTM A182 GR F304L, THD, 3000#	1
20	1" X 1/4"-150LB SCRD REDUCING INSER, 304L SS	2
ITEM #	**ADDITIONAL ITEMS FOR FIELD ROUTING TO ACCOMMODATE VARIOUS CONDITIONS**	
A1	1/2"-PIPE, WELDED E=0.8, ASME B36.19, B36.10, ASTM A312 GR TP304L, PBE, SCH 40S	
A2	1/2"-ELL, 90-DEG, ASME B16.11, ASTM A182 GR F304L, SW, 3000#	
A3	1/2"-ELL, 45-DEG, ASME B16.11, ASTM A182 GR F304L, SW, 3000#	
A4	1"-PIPE, WELDED E=0.8, ASME B36.19, B36.10, ASTM A312 GR TP304L, PBE, SCH 40S	
A5	1"-ELL, 90-DEG, ASME B16.11, ASTM A182 GR F304L, SW, 3000#	
A6	1"-ELL, 45-DEG, ASME B16.11, ASTM A182 GR F304L, SW, 3000#	

SECTION 23 10 30

DAY TANK PACKAGED UNIT
GAINESVILLE, GA



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PART 1 - GENERAL

1.01 SCOPE

A. Provide a completely weatherproof packaged designed 150 gallon double wall fuel oil day tank for use with an existing standby generator for installation outdoors. Day tank shall be complete in all respects in order to provide the generator with a reliable, local source of fuel. Day tank shall be for use with a main tank described elsewhere to provide an automatic, self-refilling fuel oil supply system.

1.02 GOVERNING STANDARDS / REFERENCES

Equipment shall comply with the latest revisions of the applicable federal, state, and local codes and regulations including requirements of NFPA, EPA, OSHA, UL, and all other relevant entities, but not limited to the following:

A. NFPA 30. Flammable and Combustible Liquids Code.

B. NPFA 37. The Standard for Installation and use of Stationary Combustible Engine and Gas Turbines.

C. NFPA 70 National Electrical Code.

D. UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids.

E. UL 508A - Standard for Industrial Control Panels

All work specified herein shall conform to or exceed the requirements of the above referenced codes, regulations and standards; provided, that whenever the provisions of said publications are in conflict with the requirements specified herein, the stringent requirement shall apply..

1.03 SUBMITTALS

A. Shop Drawings: Indicate Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of day tank set and other components specified.
2. Pump horsepower, capacity.
3. Wiring Diagrams: Power, signal, and control wiring.

B. Packaged Unit IOM manual;

1. The pump unit shall be supplied with an illustrated manufacturers manual which includes the following:
   (a) Registration certificate
   (b) Glossary

(c) Equipment list

(d) Detailed description of operation

(e) Pump specifications

(f) Installation instructions

(g) Troubleshooting instructions

(h) Maintenance instructions

(i) Piping diagram

(j) Electrical drawing

(k) Exploded view parts drawing/parts list

(l) Dimensional drawing

(m) Warranty card and Test Reports

1.04 OPERATION AND MAINTENANCE

A. Operation Data: Include installation instructions and exploded assembly views.

B. Maintenance Data: Include maintenance and inspection data, replacement part numbers and availability, and service depot location and telephone number.

C. Provide (4) copies of Operations and Maintenance manual. One copy shall be attached to tank in a clear PVC weather resistant document tube.

1.05 QUALITY ASSURANCE

A. Design, construction, inspection, and testing shall be in compliance with the latest version of the NFPA-30 and all manufacturers' current installation instructions.

B. Comply with NFPA 70 "National Electric Code" for equipment, wiring, and conduit installed under this section.

C. All equipment shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components or overall assembly.

D. Day Tanks: Authorized manufacturers representatives shall provide on-site training of installers and supervision of the installation and testing of the equipment and systems to assure conformance to written instructions of manufacturers.

E. Entire installation shall conform to requirements of local and state pollution control authorities.

F. Where specified codes or standards conflict, consult the Owner.

G. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a safe, complete and fully operational system which conforms to contract requirements and in which no item is subject to conditions beyond its design capabilities.

1.06 QUALIFICATIONS

A. Manufacturer shall have a minimum of ten years' experience in the design and construction of Underwriters Laboratories (UL) listed day tank systems.

PART 2 - PRODUCTS

2.01 DIESEL FUEL DAY TANK

A. General

1. The day tank package shall include all inlet flow control devices, valves, check valves, relief valves, level controls, pump controls, indicators, alarms, and all other devices as required to form an integrated functional system, such that field installation is restricted largely to external piping, wiring, and such intermediate devices that are required by code and/or the project installation to interconnect the bulk source of supply to the day tank, the day tank to the generator and to provide for external vents as per local codes and UL142, NFPA 30, and NFPA 37.
2. The system shall be designed and installed in accordance with applicable sections of NFPA 30, NFPA 37, UL 508, and UL 142.
3. All electrical utilization equipment and wiring shall be of a type specified by and installed in accordance with NFPA 70, “National Electric Code.”

B. Construction

1. Day tank shall be a Pryco PY150ULDW or pre-approved equivalent, and constructed in accordance with Underwriters Laboratories Standard UL-142. The day tank shall also be constructed in accordance with Flammable and Combustible Liquids Code, NFPA 30; and The Standard for Installation and use of Stationary Combustible Engine and Gas Turbines, NPFA 37. Day tank shall be made of heavy gauge steel construction. Tank shall include removable, nonconductive top cover for exterior applications. Tank shall be coated with rust inhibitor inside, primed and finish painted outside. The tank shall include the following fittings and accessories, as a minimum:
   (a) 2 x 1 inch NPT engine fuel supply with dip tube.
   (b) 2 x 1 inch NPT engine fuel return with dip tube.
   (c) NPT fittings for emergency vents (primary and secondary) with appropriate UL listed vent caps, piping, and fittings to make a complete installation.
   (d) 1 inch NPT overflow with plug.
   (e) 2 inch NPT normal vents (primary and secondary) with appropriate UL listed vent caps, piping, and fittings to make a complete installation.
   (f) 6-1/2 inch square inspection port below electrical controls
   (g) Supply Pump with built-in pressure relief valve.
   (h) Reverse Pump with built-in pressure relief valve.
   (i) Intake piping to Supply Pump with two (2) solenoid valves, priming tee, and strainer.
   (j) Intake piping to Return Pump with priming tee, and check valve on dip tube.
   (k) Side-view Fuel Gauge for U/L Tank.
   (l) Fuel Inlet/Outlet to/from main fuel storage tank (via integral pumps). With drop tubes.

(m) Primary tank drain through the top w/ drop tube (plugged).

(n) Secondary tank (interstitial space) drain with ball valve and plug.

(o) Spare 2 inch fitting on primary tank (plugged).

(p) 1-1/2 inch Inspection Port.

(q) Fitting for leak detection device for double wall secondary containment area.

(r) Industrial Enclosed Electronic Control Panel.

(s) Weatherproof Cover for Duplex Pumps, Motors, and Control Panel.

(t) Motor mounting plates(s).

2. Capacity of primary tank shall be 150 gallons.
3. The entire day tank package, including tank, pumps, electronic control Panel, shall be entirely weatherproof designed for outdoor installation.

C. Double Wall Construction

1. The day tank shall include a welded steel sealed fuel containment basin (outer tank) to prevent escape of fuel into the environment in the event of a tank rupture. The outer tank shall be primed and finish painted.
2. Outer tank: The outer tank shall consist of a closed-top, welded heavy gauge steel structure sized at a minimum of 150 percent of the tank capacity.

D. Leak Detection System

1. A double wall containment area leak detector sensor shall be wired into the electronic control panel (ECP). This will shut down the supply pump and motor in case of a fuel leak into the containment basin. Provide factory test report for sensor.

E. Electronic Control Panel (ECP)

1. The electronic control Panel (ECP) shall be Pryco or approved equivalent. The system shall have float switches to provide level signals to the ECP to control pump activity and alarm signals. The following shall be provided as part of the system (Actual settings and sequencing may differ by manufacturer):

(a) Fuel level indicator

(b) High fuel level warning (activates at 106% of tank capacity)

(c) Low fuel level warning (activates at 62%)

(d) Critical low level alarm (activates at 6%)

(e) Critical High Fuel Alarm (activates at 103%)

(f) Fuel in basin alarm

(g) Supply Pump control (pump on at 87%, off at 100%).
(Provide capability for supply pump to be interlocked with a remote solenoid valve.)

(h) Return Pump control (pump on at 101%, off at 94%).

(i) ECP functional signal.

2. Provide a lockable NEMA 3R Hinged Window Enclosure Kit over the Control Panel Lights and Push-Buttons with a sealed Polycarbonate or Plexiglass viewing area. Similar to the Hoffman No. CWHD3136.
3. All warnings shall provide contacts for remote annunciation (3 amps at 120 VAC). All signals and warnings shall be indicated by lights on the control panel. All warnings shall be provided with normally open and normally closed contacts for remote annunciation. The ECP shall be capable of being manually controlled with “On”, “Off”, and “Test” buttons. A secure internal test button shall be provided to verify relays’ functionality. The system shall be UL-508 listed. Electrical characteristics shall be 120 VAC, 1 phase, 60 Hz.
4. All electronic systems must be capable of operating in an area with high RFI (Radio Frequency Interference). Systems shall be utilized at sites where the field space intensity may exceed 10 volts per meter.
5. Provide output signals from ECP for Day Tank Common Alarm and Containment Basin Leak Detection. Output signals to be compatible with the Fuel Storage Monitoring System, Incon TS-550.
6. Provide output signal from ECP for interlocking Supply Pump Operation with remote solenoid valve that will be located in Fuel Supply Line near Main Aboveground Storage Tank. Solenoid valve (furnished under separate specification) is to open when Supply Pump is on and is to close when Supply Pump is off.

F. Package Features (some may also be described elsewhere)

1. Power Available Lamp

   A green pilot light illuminates when the control and/or motor circuits are energized and the system is ready.

2. Alarm Test Switch

   A momentary contact switch that tests up to 4 alarm circuits.

3. Critical Low Fuel Alarm w/ Engine Shutdown Capability

   A separate float switch that activates a red light on the control panel when the fuel reaches a critical low fuel level (6%). It opens a set of normally closed contacts that will shut down the generator engine when wired. Includes a double pole relay that closes normally open contacts for a 3 amp remote outgoing signal.

4. High / Low Combination Fuel Level Alarm

   Dual separate float switches that activate red lights on the control panel when a low or high fuel level is sensed.

5. Critical High Fuel Alarm w/ Pump Motor Shutdown

   This switch/alarm assembly prevents tank overfilling when the fuel level reaches a critical high level set at 3 inches from top or 103%. A separate float switch activates a red alarm light on the control panel, shuts down the supply pump motor, and closes a normally open solenoid valve that is installed at the fuel inlet.

6. Leak Detector

   A sensor within the double wall containment area that upon detection of a leak will turn on a red alarm light on the control panel and will shut down the supply pump motor and close solenoid valve. Dry terminal contacts are supplied for connection of customer supplied device of up to 15 amps. Provide copy of factory test report.

7. Additional Alarm Dry Contacts

   Five (5) additional remote signal dry contacts to provide a heavy-duty, remote signal of a specified alarm, up to 3 amps. (Critical Low, Low, High, Critical High, Leak)

8. Reverse Flow Controller

   To pump fuel from Day Tank back to main storage tank. Includes float switch and pipe stems. Activates reverse pump, locks out supply pump, illuminates “Reverse Pump Running” Light.

9. Enclosed Industrial Control Panel

   A heavy gauge steel enclosure that meets UL 508 requirements, with UL listed components; contactors, relays, sockets, lights, switches, wires and connectors. With NEMA 3R weather proof enclosure.

G. Supply Pumping System

1. Provide a supply pump with high lift capacity to draw fuel oil from the main tank to the day tank. Minimum pump capacity shall be 2 gpm (with 20 foot of suction lift capability at sea level), 1/3 HP, 1 phase, 60 Hz thermally protected motor. With built-in pressure relief valve. (Provide capability for supply pump to be interlocked with a remote solenoid valve.)

H. Reverse Pumping System

1. Provide a reverse pump to return fuel to the main tank in the event the day tank level exceeds 101% of its normal capacity. The reverse pump shall be activated by a separate, critical high level float switch. The reverse pump capacity will be equal to or greater than the capacity of the supply pump. Minimum pump capacity shall be 4 gpm, 1/3 HP, 1 phase, 60 Hz thermally protected motor. With built-in pressure relief valve.

I. Testing

   Perform testing in compliance with the manufacturer's published testing instructions.

J. Training

   Representatives of equipment suppliers for the day tank shall provide necessary training and technical support to the Owner so that the Owner may properly operate and maintain the systems

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be by the Contractor.

B. Day Tank manufacturer shall provide technical support to Contractor as needed.

3.02 DEMONSTRATION

A. Provide a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged day tanks. The training period shall consist of a total 4 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance. The course instructions shall cover pertinent points involved in operating, starting, stopping, servicing the equipment, as well as all major elements of the operation and maintenance manuals. Additionally, the course instructions shall demonstrate all routine maintenance.

B. Manufacturer shall demonstrate day tank operation at the final field installation site.

END OF SECTION 23 10 30

SECTION 26 05 00.00 40

COMMON WORK RESULTS FOR ELECTRICAL
10/15/12

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 709(2001; R 2007) Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE Std 100	(2000) The Authoritative Dictionary of IEEE Standards Terms

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA FB 1	(2007) Standard for Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable
NEMA KS 1	(2001; R 2006) Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
NEMA OS 1	(2008) Standard for Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports
NEMA PB 1	(2006; Errata 2008) Standard for Panelboards
NEMA RN 1	(2005) Standard for Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA TC 2	(2003) Standard for Electrical Polyvinyl Chloride (PVC) Tubing and Conduit
NEMA VE 1	(2009) Standard for Metallic Cable Tray Systems
NEMA Z535.1	(2006) Standard for Safety Colors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008; AMD 1 2008) National Electrical Code - 2008 Edition

UNDERWRITERS LABORATORIES (UL)

UL 1	(2005; Rev thru Jul 2007) Standard for Flexible Metal Conduit
UL 1242	(2006; Rev thru Jul 2007) Standard for Electrical Intermediate Metal Conduit -- Steel
UL 489	(2009) Standard for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
UL 6	(2007) Standard for Electrical Rigid Metal Conduit-Steel
UL 797	(2007) Standard for Electrical Metallic Tubing -- Steel
UL 870	(1995; Rev thru Jul 2003) Standard for Wireways, Auxiliary Gutters, and Associated Fittings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.]

SD-03 Product Data

Submit manufacturer's catalog data for the following items:

Wire and Cable
Splices and Connectors
Switches
Circuit Breakers
Panelboards

SD-06 Test Reports

Continuity Test
Phase-Rotation Tests
Insulation Resistance Test
Grounding Resistance Test

1.3 PREVENTION OF CORROSION

Protect metallic materials against corrosion. Provide equipment enclosures with the standard finish by the manufacturer when used for most indoor and outdoor installations. Do not use aluminum when in contact with earth or concrete and, where connected to dissimilar metal, protect by approved fittings and treatment. Ferrous metals such as, but not limited to,

anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous spare parts not of corrosion-resistant steel shall be hot-dip galvanized except where other equivalent protective treatment is specifically approved in writing.

1.4 DEFINITIONS

a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE Std 100.

b. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.

1.5 GENERAL REQUIREMENTS

Submit Material, Equipment, and Fixture Lists for the following items showing manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabrication site.

Submit Manufacturer's Instructions including special provisions required to install equipment components and system packages. Special notices shall detail impedances, hazards and safety precautions.

1.6 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.7 FIELD FABRICATED NAMEPLATES

Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style.

PART 2 PRODUCTS

2.1 MATERIALS

Materials and equipment to be provided shall be the standard cataloged products of manufacturers regularly engaged in the manufacture of the products.

2.1.1 Rigid Steel Conduit

Rigid steel conduit shall comply with UL 6 and be galvanized by the hot-dip process. Rigid steel conduit shall be polyvinylchloride (PVC) coated in accordance with NEMA RN 1, where underground and in corrosive areas.

Fittings for rigid steel conduit shall be threaded.

Gaskets shall be solid. Conduit fittings with blank covers shall have gaskets, except in clean, dry areas or at the lowest point of a conduit run where drainage is required.

Covers shall have captive screws and be accessible after the work has been completed.

2.1.2 Electrical Metallic Tubing (EMT)

EMT shall be in accordance with UL 797 and be zinc coated steel. Couplings and connectors shall be zinc-coated, raintight, gland compression with insulation throat. Crimp, spring, or setscrew type fittings are not acceptable.

2.1.3 Flexible Metallic Conduit

Flexible metallic conduit shall comply with UL 1 and be galvanized steel.

Fittings for flexible metallic conduit shall be specifically designed for such conduit.

Provide liquidtight flexible metallic conduit with a protective jacket of PVC extruded over a flexible interlocked galvanized steel core to protect wiring against moisture, oil, chemicals, and corrosive fumes.

Specifically design fittings for liquidtight flexible metallic conduit for such conduit.

2.1.4 Intermediate Metal Conduit

Intermediate metal conduit shall comply with UL 1242 and be galvanized.

2.1.5 Rigid Nonmetallic Conduit

Rigid nonmetallic conduit shall comply with NEMA TC 2 and NEMA TC 3 with wall thickness not less than Schedule 40.

2.1.6 Wireways and Auxiliary Gutters

Wireway and auxiliary gutters shall be a minimum 4- by 4 inch trade size conforming to UL 870.

2.1.7 Cable Trays

Provide ladder type cable trays conforming to NEMA VE 1.

2.2 WIRE AND CABLE

Conductors installed in conduit shall be copper 600-volt type THWN. All conductors AWG No. 8 and larger, shall be stranded. All conductors smaller than AWG No. 8 shall be stranded.

Flexible cable shall be Type SO and contain a grounding conductor with green insulation.

Conductors installed in plenums shall be marked plenum rated.

2.3 SPLICES AND CONNECTORS

Make all splices in AWG No. 8 and smaller with approved indentor crimp-type connectors and compression tools.

Make all splices in AWG No. 6 and larger with indentor crimp-type connectors and compression tools bolted clamp-type connectors. Joints shall be wrapped with an insulating tape that has an insulation and temperature rating equivalent to that of the conductor.

2.4 SWITCHES

2.4.1 Safety Switches

Safety switches shall comply with NEMA KS 1, and be the heavy-duty type with enclosure, voltage, current rating, number of poles, and fusing as indicated. Switch construction shall be such that, when the switch handle in the "ON" position, the cover or door cannot be opened. Cover release device shall be coinproof and be so constructed that an external tool shall be used to open the cover. Make provisions to lock the handle in the "OFF" position, but the switch shall not be capable of being locked in the "ON" position.

Provide switches of the quick-make, quick-break type. Approve terminal lugs for use with copper conductors.

Safety color coding for identification of safety switches shall conform to NEMA Z535.1.

2.5 OUTLETS, OUTLET BOXES, AND PULL BOXES

Outlet boxes for use with conduit systems shall be in accordance with NEMA FB 1 and NEMA OS 1 and be not less than 1-1/2 inches deep. Furnish all pull and junction boxes with screw-fastened covers.

2.6 PANELBOARDS

Lighting and appliance branch circuit panelboards shall be the circuit-breaker type in accordance with NEMA PB 1. Bolt circuit breakers to the bus. Plug-in circuit breakers are not acceptable. Buses shall be copper of the rating indicated, with main lugs or main circuit breaker as indicated. Provide all panelboards for use on grounded ac systems with a full-capacity isolated neutral bus and a separate grounding bus bonded to the panelboard enclosure. Panelboard enclosures shall be NEMA 250, Type 1, in accordance with NEMA PB 1. Provide enclosure fronts with latchable hinged doors.

2.7 CIRCUIT BREAKERS

Circuit-breaker interrupting rating shall be not less than those indicated and in no event less than 10,000 amperes root-mean-square (rms) symmetrical at 208 volts, respectively. Multipole circuit breakers shall be the common-trip type with a single handle. Molded case circuit breakers shall be bolt-on type conforming to UL 489.

PART 3 EXECUTION

3.1 CONDUITS, RACEWAYS AND FITTINGS

Conduit runs between outlet and outlet, between fitting and fitting, or between outlet and fitting shall not contain more than the equivalent of four 90-degree bends, including those bends located immediately at the outlet or fitting.

Do not install crushed or deformed conduit. Avoid trapped conduit runs where possible. Take care to prevent the lodgment of foreign material in the conduit, boxes, fittings, and equipment during the course of construction. Clear any clogged conduit of obstructions or be replaced.

Conduit and raceway runs concealed in or behind walls, above ceilings, or exposed on walls and ceilings 5 feet or more above finished floors and not subject to mechanical damage may be electrical metallic tubing (EMT).

3.1.1 Rigid Steel Conduit

Make field-made bends and offsets with approved hickey or conduit bending machine. Conduit elbows larger than 2-1/2 inches shall be long radius.

Provide all conduit stubbed-up through concrete floors for connections to free-standing equipment with the exception of motor-control centers, cubicles, and other such items of equipment, with a flush coupling when the floor slab is of sufficient thickness. Otherwise, provide a floor box set flush with the finished floor. Conduits installed for future use shall be terminated with a coupling and plug set flush with the floor.

3.1.2 Electrical Metallic Tubing (EMT)

EMT shall be grounded in accordance with NFPA 70, using pressure grounding connectors especially designed for EMT.

3.1.3 Flexible Metallic Conduit

Use flexible metallic conduit to connect recessed fixtures from outlet boxes in ceilings, transformers, and other approved assemblies.

Bonding wires shall be used in flexible conduit as specified in NFPA 70, for all circuits. Flexible conduit shall not be considered a ground conductor.

Electrical connections to vibration-isolated equipment shall be made with flexible metallic conduit.

Liquidtight flexible metallic conduit shall be used in wet and oily locations and to complete the connection to motor-driven equipment.

3.1.4 Intermediate Conduit

Make all field-made bends and offsets with approved hickey or conduit bending machine. Use intermediate metal conduit only for indoor installations.

3.1.5 Wireway and Auxiliary Gutter

Straight sections and fittings shall be bolted together to provide a rigid, mechanical connection and electrical continuity. Dead ends of wireways and auxiliary gutters shall be closed. Plug all unused conduit openings.

Wireways for overhead distribution and control circuits shall be supported at maximum 5-foot intervals.

Auxiliary gutters used to supplement wiring spaces for equipment not contained in a single enclosure shall contain no switches, overcurrent devices, appliances, or apparatus and be not more than 30 feet long.

3.1.6 Surface Raceways and Assemblies

Surface raceways shall be mounted plumb and level, with the base and cover secured. Minimum circuit run shall be three-wire with one wire designated as ground.

3.1.7 Cable Trays

Support cable trays from ceiling hangers, equipment bays, or floor or wall supports. Cable trays may be mounted on equipment racks. Provide support when the free end extends beyond 3 feet. Maximum support spacing shall be 6 feet. Trays 10-inches wide or less shall be supported by one hanger. Cable trays greater than 10-inches wide shall be supported by two hangers. Bond all cable trays at splices.

3.2 WIRING

Feeder and branch circuit conductors shall be color coded as follows:

CONDUCTOR	COLOR AC
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Equipment Grounds	Green

Conductors up to and including AWG No. 2 shall be manufactured with colored insulating materials. Conductors larger than AWG No. 2 shall have ends identified with color plastic tape in outlet, pull, or junction boxes.

Splice in accordance with the NFPA 70. Provide conductor identification within each enclosure where a tap, splice, or termination is made and at the equipment terminal of each conductor. Terminal and conductor identification shall match as indicated.

Where several feeders pass through a common pullbox, the feeders shall be tagged to clearly indicate the electrical characteristics, circuit number, and panel designation.

3.3 SAFETY SWITCHES

Securely fasten switches to the supporting structure or wall, utilizing a minimum of four 1/4 inch bolts. Do not use sheet metal screws and small machine screws for mounting. Do not mount switches in an inaccessible location or where the passageway to the switch may become obstructed. Mounting height shall be 5 feet above floor level, when possible.

3.4 BOXES AND FITTINGS

Furnish and install pullboxes where necessary in the conduit system to facilitate conductor installation. Conduit runs longer than 100 feet or with more than four right-angle bends shall have a pullbox installed at a convenient intermediate location.

Securely mount boxes and enclosures to the building structure with supporting facilities independent of the conduit entering or leaving the boxes.

3.5 PANELBOARDS

Securely mount panelboards so that the top operating handle does not exceed 72-inches above the finished floor. Do not mount equipment within 36 inches of the front of the panel. Directory card information shall be complete and legible.

3.6 IDENTIFICATION PLATES AND WARNINGS

Furnish and install identification plates for lighting and power panelboards, motor control centers, all line voltage heating and ventilating control panels, fire detector and sprinkler alarms, door bells, pilot lights, disconnect switches, manual starting switches, and magnetic starters. Process control devices and pilot lights shall have identification plates.

Furnish identification plates for all line voltage enclosed circuit breakers, identifying the equipment served, voltage, phase(s) and power source. Circuits 480 volts and above shall have conspicuously located warning signs in accordance with OSHA requirements.

3.7 PAINTING

Exposed conduit, supports, fittings, cabinets, pull boxes, and racks shall be thoroughly cleaned and painted.

3.8 SEISMIC REQUIREMENTS

Electrical equipment and raceways/conduits/cable trays shall be supported to withstand seismic forces as given in FEMA 413 and applicable codes.

3.9 FIELD TESTING

Submit Test Reports in accordance with referenced standards in this section.

After completion of the installation and splicing, and prior to energizing the conductors, perform wire and cable continuity and insulation tests as herein specified before the conductors are energized.

Contractor shall provide all necessary test equipment, labor, and personnel to perform the tests, as herein specified.

Isolate completely all wire and cable from all extraneous electrical connections at cable terminations and joints. Substation and switchboard feeder breakers, disconnects in combination motor starters, circuit breakers in panel boards, and other disconnecting devices shall be used to isolate the circuits under test.

Perform Insulation-Resistance Test on each field-installed conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. Take readings after 1 minute and until the reading is constant for 15 seconds. Minimum insulation-resistance values shall not be less than 25 Megohms for 300 volt rated cable and 100 Megohms for 600 volt rated cable. For circuits with conductor sizes 8AWG and smaller insulation resistance testing is not required.

Perform Continuity Test to insure correct cable connection (i.e. correct phase conductor, grounded conductor, and grounding conductor wiring) end-to end. Any damages to existing or new electrical equipment resulting from contractor mis-wiring will be repaired and re-verified at contractor's expense. All repairs shall be approved by the CO prior to acceptance of the repair.

Conduct Phase-Rotation Tests on all three-phase circuits using a phase-rotation indicating instrument. Perform phase rotation of electrical connections to connected equipment clockwise, facing the source.

Conduct Earth Ground Resistance Test, utilizing the 3-pole Fall-of-Potential Method, to verify the resistance of the module grounding system, when isolated, has a resistance to "true" earth of 5 ohms or less.

Final acceptance will depend upon the successful performance of wire and cable under test. Do not energize any conductor until the final test reports are reviewed and approved by the CO.

-- End of Section --

SECTION 31 23 00.00 20

EXCAVATION AND FILL
08/12

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 136	(2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D 1140	(2000; R 2006) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1557	(2009) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D 2487	(2006e1) Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 698	(2007e1) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))

1.2 DEFINITIONS

1.2.1 Degree of Compaction

Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 698, for general soil types, abbreviated as percent laboratory maximum density.

1.2.2 Hard Materials

Weathered rock, dense consolidated deposits, or conglomerate materials

which are not included in the definition of "rock" but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

1.2.3 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding 1 cubic yard in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

1.3 SUBMITTALS

The following shall be submitted:

SD-06 Test Reports

Borrow Site Testing

Structural Fill Material test

Density tests

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

1.4 DELIVERY, STORAGE, AND HANDLING

Perform in a manner to prevent contamination or segregation of materials.

1.5 QUALITY ASSURANCE

1.5.1 Utilities

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Excavation made with power-driven equipment is not permitted within two feet of known utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Site Manager. Report damage to utility lines or subsurface construction immediately to the Site Manager.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

2.1.1 Structural Fill Material

The structural fill material shall be free of organic matter and debris. The fill shall exhibit a low to moderate plasticity, with a Plasticity

Index less than 30. The fill shall exhibit a maximum dry density of at least 90 pounds per cubic foot, as determined by the Standard Proctor Test, ASTM D 698. The fill shall exhibit a moisture content within 3 percent of the Standard Proctor optimum moisture content, ASTM D 698, during compaction.

2.2 BORROW

Obtain borrow materials required in excess of those furnished from excavations from sources outside of project property.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Underground Utilities

Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction.

3.1.2 Machinery and Equipment

Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair, or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

3.2 SURFACE PREPARATION

3.2.1 Stripping

Strip the project site receiving crushed stone, asphalt or concrete. If crushed stone is not within project scope, strip only those areas required for excavation. Strip suitable soil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Material unsuitable for use as topsoil shall be wasted. Locate topsoil so that the material can be used readily for the finished grading. Where sufficient existing topsoil conforming to the material requirements is not available on site, provide borrow materials suitable for use as topsoil. Protect topsoil and keep in segregated piles until needed. All unsuitable materials shall be removed from the project site.

3.3 EXCAVATION

Excavate to contours, elevations, and dimensions indicated. Keep excavations free from water. Excavate soil disturbed or weakened by Contractor's operations, soils softened or made unsuitable for subsequent construction due to exposure to weather. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed. Refill with structural fill and compact to 95 percent of ASTM D 698 maximum density. Bearing surfaces for foundations shall not be disturbed or left exposed during inclement weather. Following proof rolling and approval of the subgrade, a 3 inch thick layer of lean concrete shall be placed over the bearing surfaces for protection.

3.3.1 Structures With Spread Footings

Ensure that footing subgrades have been inspected, tested and approved by the Geotechnical Engineer of Record prior to concrete placement. Fill over excavations with concrete during foundation placement.

3.3.2 Excavated Materials

All unsatisfactory material shall be disposed of as specified in Paragraph "DISPOSITION OF SURPLUS MATERIAL."

3.4 SUBGRADE PREPARATION

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Site Manager.

3.4.1 Proof Rolling

Proof rolling of the main foundation area and the transmitter foundation area shall be done on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which would promote degradation of an otherwise acceptable subgrade. After excavation, proof roll the existing subgrade with a loaded tandem axle dump truck or similar piece of rubber-tired equipment (minimum weight load of 25 tons). Notify the Site Manager a minimum of 3 days prior to proof rolling. Proof rolling shall be performed in the presence of the Site Manager and the Geotechnical Engineer of Record. Material that deflects, ruts or pumps during proof rolling shall be undercut and replaced with structural fill material.

3.5 FILLING AND BACKFILLING

Fill and backfill to contours, elevations, and dimensions indicated. Compact each lift before placing overlaying lift.

3.5.1 Structural Fill Material Placement

Place in 10 inch maximum loose lift thickness. If fill areas are confined and only allow hand tamping or walk behind rollers, the maximum loose lift thickness shall not exceed 5 inches. Do not place over wet or frozen areas. Backfill adjacent to structures shall be placed as structural elements are completed and accepted. Backfill against concrete only when approved. Place and compact material to avoid loading upon or against structure.

3.6 BORROW

Where satisfactory materials are not available in sufficient quantity from required excavations, approved borrow materials shall be obtained as specified herein.

3.7 COMPACTION

3.7.1 Structural Foundations, Trenches and General Site

Compact structural foundation areas, utility trenches, and the remaining general site to 95 percent of ASTM D 698.

3.8 FINISH OPERATIONS

3.8.1 Grading

Finish grades as indicated within one-tenth of one foot. Grade areas to drain water away from structures. Maintain areas free of trash and debris. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.

3.9 DISPOSITION OF SURPLUS MATERIAL

Remove from property surplus or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber.

3.10 FIELD QUALITY CONTROL

3.10.1 Sampling

Take the number and size of samples required to perform the following tests.

3.10.2 Testing

Perform one of each of the following tests for each material used. Provide additional tests for each source change.

3.10.2.1 Structural Fill Material Testing

Test select material in accordance with ASTM C 136 for conformance to ASTM D 2487 gradation limits; ASTM D 1140 for material finer than the No. 200 sieve; ASTM D 698 or ASTM D 1557 for moisture density relations, as applicable.

3.10.2.2 Density Tests

Test density in accordance with ASTM D 1556. Test each lift at the frequency determined by the Geotechnical Engineer of Record. Include density test results in daily report.

-- End of Section --

SECTION 31 31 16

SOIL TREATMENT FOR SUBTERRANEAN TERMITE CONTROL
08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

7 USC Section 136	Federal Insecticide, Fungicide, and Rodenticide Act

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following:

SD-03 Product Data

Termiticide Application Plan

Termiticide application plan with proposed sequence of treatment work with dates and times. Include the termiticide trade name, EPA registration number, chemical composition, formulation, concentration of original and diluted material, application rate of active ingredients, method of application, area/volume treated, amount applied; and the name and state license number of the state certified applicator.

Termiticides

Manufacturer's label and Material Safety Data Sheet (MSDS) for termiticides proposed for use.

Warranty

Copy of Contractor's warranty.

SD-06 Test Reports

Quality Assurance

Pest Management Report and copies of daily records signed by an officer of the Contractor.

Qualifications

1.3 QUALITY ASSURANCE

Comply with 7 USC Section 136 for requirements on Contractor's licensing,

certification, and record keeping. Upon completion of this work, submit Pest Management Report identifying target pest, type of operation, brand name and manufacturer of pesticide, formulation, area treated, and concentration or rate of application used.

1.3.1 Qualifications

For the application of pesticides, use the services of a subcontractor whose principal business is pest control. The subcontractor shall be licensed and certified in the state where the work is to be performed. Termiticide applicators shall also be certified in the U.S. Environmental Protection Agency (EPA) pesticide applicator category which includes structural pest control. Submit the qualifications and state license number of the termiticide applicator.

1.3.2 Safety Requirements

Formulate, treat, and dispose of termiticides and their containers in accordance with label directions. Draw water for formulating only from an acceptable source, and fit the filling hose with a backflow preventer meeting local plumbing codes or standards. The filling operation shall be under the direct and continuous observation of a contractor's representative to prevent overflow. Secure pesticides and related materials under lock and key when unattended. Ensure that proper protective clothing and equipment are worn and used during all phases of termiticide application. Properly dispose of used pesticide containers off radio station property.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Deliver termiticide material to the site in the original unopened containers bearing legible labels indicating the EPA registration number and manufacturer's registered uses. All other materials, to be used on site for the purpose of termite control, shall be delivered in new or otherwise good condition as supplied by the manufacturer or formulator.

1.4.2 Inspection

Inspect termiticides upon arrival at the job site for conformity to type and quality in accordance with paragraph TERMITICIDES. Each label shall bear evidence of registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended or under appropriate regulations of the host county. Other materials shall be inspected for conformance with specified requirements. Remove unacceptable materials from the job site.

1.4.3 Storage

Store materials in designated areas and in accordance with manufacturer's labels. Termiticides and related materials shall be kept under lock and key when unattended.

1.4.4 Handling

Observe manufacturer's warnings and precautions. Termiticides shall be handled in accordance with manufacturer's labels, preventing contamination by dirt, water, and organic material. Protect termiticides from sunlight as recommended by the manufacturer.

1.5 SITE CONDITIONS

The following conditions will determine the time of application.

1.5.1 Runoff and Wind Drift

Do not apply termiticide during or immediately following heavy rains. Applications shall not be performed when conditions may cause runoff or create an environmental hazard. Applications shall not be performed when average wind speed exceeds 10 miles per hour. The termiticide shall not be allowed to enter water systems, aquifers, or endanger humans or animals.

1.5.2 Placement of Concrete

Place concrete slab covering treated soils as soon as the termiticide has reached maximum penetration into the soil. Time for maximum penetration shall be as recommended by the manufacturer.

1.6 WARRANTY

The Contractor shall provide a 5 year written warranty against infestations or reinfestations by subterranean termites of the buildings or building additions constructed under this contract. Warranty shall include annual inspections of the buildings or building additions. If live subterranean termite infestation or subterranean termite damage is discovered during the warranty period, and the soil and building conditions have not been altered in the interim, the Contractor shall:

a. Retreat the soil and perform other treatment as may be necessary for elimination of subterranean termite infestation;

b. Repair damage caused by termite infestation; and

c. Reinspect the building approximately 180 days after the retreatment.

PART 2 PRODUCTS

2.1 TERMITICIDES

Provide termiticides currently registered by the EPA. Select non-repellant termiticide for maximum effectiveness and duration after application. The selected termiticide shall be suitable for the soil and climatic conditions at the project site.

PART 3 EXECUTION

3.1 VERIFICATION OF MEASUREMENT

Once termiticide application has been completed, measure tank contents to determine the remaining volume. The total volume measurement of used contents for the application shall equal the established application rate for the project site conditions. Provide written verification of the measurements.

3.2 SITE PREPARATION

Work related to final grades, foundations, or any other alterations to finished construction which might alter the condition of treated soils,

shall be coordinated with this specification.

3.2.1 Ground Preparation

Food sources shall be eliminated by removing debris from clearing and grubbing and post construction wood scraps such as ground stakes, form boards, and scrap lumber from the site, before termiticide application begins.

3.2.2 Verification

Before work starts, verify that final grades are as indicated and smooth grading has been completed. Soil particles shall be finely graded with particles no larger than 1 inch and compacted to eliminate soil movement to the greatest degree.

3.3 TERMITICIDE TREATMENT

3.3.1 Mixing and Application

A closed system is recommended as it prevents the termiticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying termiticides shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately.

3.3.2 Treatment Method

For areas to be treated, establish complete and unbroken vertical and/or horizontal soil poison barriers between the soil and all portions of the intended structure which may allow termite access to wood and wood related products.

3.3.2.1 Surface Application

Use surface application for establishing horizontal barriers directly under module foundation slab. Surface applicants shall be applied as a coarse spray and provide uniform distribution over the soil surface. Termiticide shall penetrate a minimum of 1 inch into the soil, or as recommended by the manufacturer.

3.3.2.2 Rodding and Trenching

Use rodding and trenching for establishing vertical soil barriers to the depth of the foundation footing or 4 feet, which ever is less. Width of trench shall be as recommended by the manufacturer. Rodding or other approved method may be implemented for saturating the base of the trench with termiticide. Immediately after termiticide has reached maximum penetration as recommended by the manufacturer, backfilling of the trench shall commence. Backfilling shall be in 6 inch rises or layers. Each rise shall be treated with termiticide.

3.4 CLEAN UP, DISPOSAL, AND PROTECTION

Once application has been completed, proceed with clean up and protection of the site without delay.

3.4.1 Clean Up

The site shall be cleaned of all material associated with the treatment measures, according to label instructions, and as indicated. Excess and waste material shall be removed and disposed off site.

3.4.2 Disposal of Termiticide

Dispose of residual termiticides and containers off Government property, and in accordance with label instructions and EPA criteria.

3.4.3 Protection of Treated Area

Immediately after the application, the area shall be protected from other use by erecting barricades and providing signage as required or directed.

3.5 CONDITIONS FOR SATISFACTORY TREATMENT

3.5.1 Testing

Should optional testing, performed by the Government or a third party, indicate that the samples of the applied termiticide contain less than the amount of active ingredient specified on the label, and/or if soils are treated to a depth less than specified or approved, re-treatment will be required.

3.5.2 Disturbance of Treated Soils

Soil and fill material disturbed after treatment shall be re-treated before placement of slabs or other covering structures.

3.5.3 Termites Found Within the Warranty Period

If live subterranean termite infestation or termite damage is discovered during the warranty period, re-treat the site.

3.6 RE-TREATMENT

Where re-treatment is required, comply with the requirements specified in paragraph WARRANTY.

-- End of Section --

SECTION 32 31 13.53

HIGH-SECURITY CHAIN LINK FENCES AND GATES
04/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A 116	(2005) Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric
ASTM A 121	(2007) Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
ASTM A 153/A 153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 176	(1999; R 2009) Standard Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
ASTM A 392	(2007) Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
ASTM A 478	(1997; R 2008) Standard Specification for Chromium-Nickel Stainless Steel Weaving and Knitting Wire
ASTM A 702	(1989; R 2006) Standard Specification for Steel Fence Posts and Assemblies, Hot Wrought
ASTM A 780/A 780M	(2001; R 2006) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

ASTM A 824	(2001; R 2007) Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use With Chain Link Fence
ASTM C 94/C 94M	(2009a) Standard Specification for Ready-Mixed Concrete
ASTM F 1043	(2008) Strength and Protective Coatings on Metal Industrial Chain-Link Fence Framework
ASTM F 1083	(2008) Standard Specification for Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized) Welded, for Fence Structures
ASTM F 1184	(2005) Industrial and Commercial Horizontal Slide Gates
ASTM F 567	(2007) Standard Practice for Installation of Chain Link Fence
ASTM F 626	(2008) Standard Specification for Fence Fittings
ASTM F 900	(2005) Industrial and Commercial Swing Gates

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-F-191/4	(Rev D) Fencing, Wire and Post, Metal (Chain-Link Fence Accessories)

1.2 SUBMITTALS

Approval is required for the following submittals:

SD-02 Shop Drawings

Installation Drawings
Location of gate, corner, end, and pull posts
Gate Assembly

Installation drawings in accordance with paragraph titled, "ASSEMBLY AND INSTALLATION DRAWINGS" of this section.

SD-07 Certificates

Chain Link Fence

Submit reports, signed by an official authorized to certify on behalf of the manufacturer, attesting that the chain link fence and component materials meet the specified requirements.

Zinc Coating
Fabric
Barbed Wire
Barbed Tape (if shown on drawings)
Gate Hardware and Accessories

1.3 QUALITY ASSURANCE

1.3.1 Assembly and Installation Drawings

Submit complete Fence Installation Drawings for review and approval prior to shipment. Drawing details shall include, but are not limited to: Fence Installation, Location of gate, corner, end, and pull posts, and Gate Assembly.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to site in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

PART 2 PRODUCTS

2.1 FENCE FABRIC

2.1.1 General

Provide ASTM A 392, Class 1, zinc-coated steel wire with minimum coating weight of 1.2 ounces of zinc per square foot of coated surface. Fabricate fence fabric of 9 gauge wire woven in 2 inch mesh conforming to ASTM A 116. Set fabric height as shown. Fabric shall be twisted and barbed on the top selvage and knuckled on the bottom selvage. Secure fabric to posts using stretcher bars or ties spaced 15 inches on center, or by integrally weaving to integral fastening loops of end, corner, pull, and gate posts for full length of each post. Install fabric on opposite side of posts from area being secured.

2.2 POSTS

2.2.1 Metal Posts for Chain Link Fence

Provide posts conforming to ASTM F 1083, zinc-coated. Group IA, with external coating Type A steel pipe. Group IC steel pipe, zinc-coated with external coating Type A or Type B, meeting the strength and coating requirements of ASTM F 1043 and ASTM A 702. Provide sizes as shown on the drawings. Line posts and terminal (corner, gate, and pull) posts selected shall be of the same designation throughout the fence. Provide gate post for the gate type specified subject to the limitation specified in ASTM F 900 and/or ASTM F 1184. Maximum post spacing shall not exceed 10 feet. This spacing is based on the CLFMI "Wind Load Guide for the Selection of Line Post Spacing and Size", with wind speed, V = 120 mph.

2.2.2 Accessories

a. Provide accessories conforming to ASTM F 626. Ferrous accessories shall be zinc or aluminum coated.

b. Furnish truss rods for each terminal post. Provide truss rods with turnbuckles or other equivalent provisions for adjustment.

c. Provide Barbed wire supporting arms of the V 6 strand arm type and of the design required for the post furnished. Secure arms by bolting.

d. Furnish post caps in accordance with manufacturer's standard accessories.

e. Provide 9 gauge steel tie wire for attaching fabric to rails, braces, and posts and match the coating of the fence fabric. Miscellaneous hardware coatings shall conform to ASTM A 153/A 153M unless modified.

2.3 BRACES AND RAILS

ASTM F 1083, zinc-coated, Group IA, steel pipe, size NPS 1-1/4. Group IC steel pipe, zinc-coated, shall meet the strength and coating requirements of ASTM F 1043.

2.4 WIRE

2.4.1 Wire Ties

FS RR-F-191/4. Provide wire ties constructed of the same material as the fencing fabric.

2.4.2 Barbed Wire

Provide barbed wire conforming to ASTM A 121 zinc-coated, Type Z, Class 3, or aluminum-coated, Type A, with 12.5 gauge wire with 14 gauge, round, 4-point barbs spaced no more than 5 inches apart.

2.4.3 Tension Wire

Provide Type I or Type II tension wire, Class 4 coating, in accordance with ASTM A 824.

2.5 BARBED TAPE

Provide reinforced barbed tape, if shown on drawings: single coil, 18 inches in diameter, for fence toppings fabricated from 430 series stainless steel with a hardness range of Rockwell (30N) 37-45 conforming to the requirements of ASTM A 176. Provide stainless steel strip 0.025 inch thick by 1 inch wide before fabrication. Each barb shall be a minimum of 1.2 inch in length, in groups of 4, spaced on 4 inch centers. The stainless steel core wire shall have a 0.098 inch diameter with a minimum tensile strength of 140 psi and be in accordance with ASTM A 478. Use sixteen gauge stainless steel twistable wire ties for attaching the barbed tape to the barbed wire.

2.6 CONCRETE

ASTM C 94/C 94M, using 3/4 inch maximum size aggregate, and having minimum compressive strength of 3000 psi at 28 days. Grout shall consist of one part portland cement to three parts clean, well-graded sand and the minimum amount of water to produce a workable mix.

2.7 GATES

2.7.1 Gate Assembly

Provide gate assembly conforming to ASTM F 900 and/or ASTM F 1184 of the type and swing shown. Provide gate frames conforming to strength and coating requirements of ASTM F 1083 for Group IA, steel pipe, with external coating Type A, nominal pipe size (NPS) 1-1/2. Provide gate frames

conforming to strength and coating requirements of ASTM F 1043, for Group IC, steel pipe with external coating Type A or Type B, nominal pipe size (NPS) 1-1/2. Gate fabric shall be as specified for chain link fabric.

2.7.2 Gate Hardware and Accessories

Furnish and install latches, hinges, stops, keepers, rollers, and other hardware items as required for the operation of the gate. Latches shall be heavy duty galvanized steel drop fork style. Arrange latches for padlocking so that the padlock will be accessible from both sides of the gate. Provide stops for holding the gates in the open position. For high security applications, the gate frame shall operate below the stationary barbed wire and barbed tape.

PART 3 EXECUTION

3.1 FENCE INSTALLATION

Perform complete installation conforming to ASTM F 567.

3.1.1 Line and Grade

Install fence to the lines and grades indicated. Clear the area on either side of the fence line to the extent indicated. Space line posts equidistant at intervals not exceeding 10 feet. Terminal (corner, gate, and pull) posts shall be set at abrupt changes in vertical and horizontal alignment. Provide fabric continuous between terminal posts; however, runs between terminal posts shall not exceed 500 feet. Repair any damage to galvanized surfaces, including welding, with paint containing zinc dust in accordance with ASTM A 780/A 780M.

3.1.2 Excavation

Clear all post holes of loose material. Spread waste material where directed. Eliminate ground surface irregularities along the fence line to the extent necessary to maintain a 2 inch clearance between the bottom of the fabric and finish grade.

3.2 POST INSTALLATION

3.2.1 Earth and Bedrock

a. Set posts plumb and in alignment. Except where solid rock is encountered, set posts in concrete to the depth indicated on the drawings. Where solid rock is encountered with no overburden, set posts to a minimum depth of 18 inches in rock. Where solid rock is covered with an overburden of soil or loose rock, set posts to the minimum depth indicated on the drawing unless a penetration of 18 inches in solid rock is achieved before reaching the indicated depth, in which case terminate depth of penetration. Grout all portions of posts set in rock.

b. Portions of posts not set in rock shall be set in concrete from the rock to ground level. Posts set in concrete shall be set in holes not less than the diameter shown on the drawings. Make diameters of holes in solid rock at least 1 inch greater than the largest cross section of the post. Thoroughly consolidate concrete and grout around each post, free of voids and finished to form a dome. Allow concrete and grout to cure for 72 hours prior to attachment of any item to the posts.

Test fence post rigidity by applying a 50 pound force on the post, perpendicular to the fabric, at 5 feet above ground. Post movement measured at the point where the force is applied shall be less than or equal to 3/4 inch from the relaxed position. Test every tenth post for rigidity. When a post fails this test, make further tests on the next four posts on either side of the failed post. All failed posts shall be removed, replaced, and retested at the Contractor's expense.

3.3 FABRIC INSTALLATION

a. Install chain link fabric on the exterior side of the post. Attach fabric to terminal posts with stretcher bars and tension bands. Space bands at approximately 15 inch intervals. Install fabric and pull taut to provide a smooth and uniform appearance free from sag, without permanently distorting the fabric diamond or reducing the fabric height. Fasten fabric to line posts at approximately 15 inch intervals and fastened to all rails and tension wires at approximately 12 inch intervals.

b. Cut fabric by untwisting and removing pickets. Accomplish splicing by weaving a single picket into the ends of the rolls to be joined. The bottom of the installed fabric shall be 2 plus or minus 1/2 inch above the ground.

c. After the fabric installation is complete, exercise the fabric by applying a 50 pound push-pull force at the center of the fabric between posts; the use of a 30 pound pull at the center of the panel shall cause fabric deflection of not more than 2.5 inches when pulling fabric from the post side of the fence; every second fence panel shall meet this requirement; resecure and retest all failed panels at the Contractor's expense.

3.4 SUPPORTING ARMS

Install barbed wire supporting arms and barbed wire as indicated on the drawings and as recommended by the manufacturer. Anchor supporting arms to the posts in a manner to prevent easy removal with hand tools. Pull barbed wire taut and attach to the arms with clips or other means that will prevent easy removal.

3.5 BARBED TAPE INSTALLATION

Install stainless steel reinforced barbed tape as detailed on the drawings. Stretch out barbed tape to a coil spacing of 12 inches on center, set on top of the barbed wire and "V" shaped support arms, then secure it to the barbed wire. Secure the barbed tape to the barbed wire at the two points every spiral turn of the coil.

3.6 GATE INSTALLATION

a. Install gates at the locations shown. Mount gates to swing as indicated. Install latches, stops, and keepers as required. Install gates as recommended by the manufacturer.

b. Attach padlocks to gates or gate posts with chains. Weld or otherwise secure hinge pins, and hardware assembly to prevent removal.

3.7 GROUNDING

Ground fencing as indicated on drawings.

3.8 CLEANUP

Remove waste fencing materials and other debris from the work site each workday.

-- End of Section --